HITACHI

SERVICE MANUAL

TK

No.3029E

VT-M620E-SERIES

Technical Information

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Manuals related to the VT-M620E series

Name of Manual	Language	Manual No.
Technical Data	English	3026E(UK), 3027E(CT/VPS)
	German	3028G(CT/VPS)
Technical Information	English	3029E
	German	3030G

VHS

This video deck is a VHS type video recorder. For proper operation, only the VHS type cassette must be used.

SPECIFICATIONS AND PARTS ARE SUBJECT TO CHANGE FOR IMPROVEMENT

VIDEO CASSETTE RECORDER

May 1989 TOKAI WORKS

COMPARISON WITH PREVIOUS MODEL

ITEM		VT-M620E/M630E SERIES	VT-520E/530E SERIES
FEATURES	HQ (HIGH QUALITY)	USED	*
	TRICK PLAY	VISUAL SEARCH(X5, X9), STILL, F.ADV, SLOW#	*
	AUTOMATIC CONTROL FUNCTION	PLAY, REPEAT, REWIND, REWIND SHUT OFF, OPERATE ON/OFF, EJECT ENDLESS PLAY, INDEX, DATE RECORDING#, DIMMER	*
	IR REMOTE CONTROL	LCD & CLOCK	*
	TIMER RECORDING PROGRAMMES	8 PROGRAMMES/1 YEAR	*
	TIMER BACKUP TIME TIMER PROGRAMMED TIME DISPLAY	ABOUT 15 MINUTES START AND STOP SIMULTANIOUSLY	ABOUT 60 MINUTES START AND STOP SIMULTANIOUSLY
	INSTANT RECORDING TIMER (IRT)	CAN SET START TIME AND LENGTH	*
	TAPE COUNTER INDICATOR	INDEPENDENT	*
	CHANNEL TUNING FUNCTIONS	VOLT. SYNTHESIZER(UK) FREQ. SYNTHESIZER(CT)	* *
	EDIT SWITCH	YES#	*
	PLAYBACK PICTURE CONTROL	HIGH FREQUENCY CONTROL (BY REMOTE)	* (LOCAL CONTROL)
	SLOW TRACKING	YES	*
CHASSIS	BASIC CHASSIS TYPE	PZ	*
	CYLINDER MOTOR	THREE-PHASE OUTER ROTOR FG: 300Hz	*
	VIDEO HEADS	3 HEADS(for 630E) CH-1/CH-2: 57 μm CH-3: 57μm 2 HEADS(for 520E) CH-1/CH-2: 57 μm CONNECTOR TYPE	*(for 530E) *(for 520E)
	HEATER	NONE (HEAT SINK USED)	*
	DEW SENSOR	NO	*

* means that the contents are the same as listed in the left column.
# is not provided for the VT-M620E series.

ITEM			VT-M620E/M630E SERIES	VT-520E/530E SERIES
MAIN CONTROL ICs	VIDEO SYSTEM SYSTEM	Y.SIGNAL PROCESS	HT4937B(IC201)	HT4907C(IC201)
		CHROMA SIGNAL PROCESS	HES8455C(IC204)	HES8454C(IC301)
		SECAM DETECTOR	HES8074A(IC205)	BA7025L(IC351) (CT,VPS,DS)
		PRE/REC AMP	BA7212S(IC001:620E) BA7253S(IC001:630E)	*(520E) *(530E)
		1 H DELAY	HN7147B(IC206)	MSM6965P(IC202)
	ON-SCREEN DISPLAY	CHARACTER GEN SYNC SEPARATOR	HES8052(IC1510)#	M50455-003SP(IC1401) NJM2229S(IC1402)
	AUDIO SYSTEM	REC/PB AMP	LA7295(IC401)	*
	JACK	AUDIO INPUT SWITCH VIDEO INPUT SWITCH (/CHRACTER ADDER)	M5201L(IC2503) NJM2248(IC1502)	* *
	SERVO SYSTEM	SPEED/PHASE CONTROL	BU2745S(IC601)	HD49726(IC601)
		CYLINDER MOTOR DRIVE	LB1684H(IC1651)	HA13403 (IC603)
		CAPSTAN MOTOR DRIVE	SA2006A(IC01)	M54680FP (IC1610)
		TRICKPLAY CONTROL	M54874P(IC1601)#	*(IC602)
	SYSTEM CONTROL	SYSTEM CONTROL µP	HD4074008A03S(IC901) HD4074019(IC901:630E)	HD614088SC50 (IC901)
		LOADING MOTOR DRIVE	BA6209U4(IC902)	*
	TIMER	TIMER µP	M50957-680SP(IC701)CT M50957-679SP(IC701)UK	M50955-662SP (IC701)CT M50954-663SP (IC701)UK
		EAROM	M6M80021(IC702)	CSK1013P(IC702)
	CH-TUNING SYSTEM	TUNING CONTROL	µPC1484CA (IC801,F.S) LA7935(IC801 V.S UK)	* *
	POWER SUPPLY	REGULATOR	STK5372H (IC851)	*
	VPS(for VPS)	VPS DECODER	SDA5642(IC101)	*

* means that the contents are the same as listed in the left column.

CHAPTER 1 VIDEO CIRCUIT

1-1 Outline of Video Circuit

Fig. 1-1 is a simplified diagram showing the video signal route in the VT-M620E series.
The video detector incorporated in the tuner/IF block detects a video signal, and outputs an 1 Vp-p video signal via pin 9 to video input select switch/character adder IC1502 on the jack circuit board. The input select switch S2 in IC1502 selects the video signal supplied from the EURO jack or IF block according to the input selection command issued by the system control µP and applies it to blocking switch S1. The blocking switch blocks the input signal from entering the recording circuit in the playback mode. The output of switch S1 is supplied to luminance processor IC201 and chroma processor IC204 on the luma/chroma circuit board.

The luminance recording stage in IC201 receives an 1 Vp-p video signal via pin 12, converts it to an FM signal, supplies the FM signal via pin 1 (0.4 Vp-p) to the record amp/preamp on the preamp circuit board. The chroma record stage in IC204 receives the 4.43 MHz chroma component contained in the composite video signal at pin 4, and frequency-converts it to a 627 kHz chroma signal and then supplies it to record amp IC001 via pin 6 (0.6 Vp-p).

The record amp in IC001 combines the luminance recording signal and chrominance recording signal to create a composite video recording signal and amplifies it, thus supplying the recording current of approx. 20 mAp-p to the video heads. The video signal to be monitored is selected by switch S1 in IC201 and is supplied to the RF converter and EURO jack through pin 20 (2 Vp-p).
During playback, the video heads pick up weak FM signals (including chroma playback signal: 0.3 mVp-p) and supply them to the preamplifiers. The preamplifiers amplify the FM playback signals and combine them to create a continuous FM signal of 0.2 - 0.3 Vp-p (containing the chroma playback signal) and supply them to the luminance playback circuitry in IC201 and chroma playback circuitry in IC204.

The chroma playback circuitry receives the 627 kHz chroma playback signal through a lowpass filter and pin 7, and frequency-converts it to a 4.43 MHz chroma signal. Then the chroma circuitry outputs a 4.43 MHz chroma signal of 1.2 Vp-p via pin 1 and supplies it to the luminance playback circuitry in IC201. The luminance playback circuitry receives the playback FM signal at pin 9 and demodulates it to a base-band luminance signal. IC201 combines the base-band luminance signal and 4.43 MHz chroma playback signal to create a composite playback video signal. The 2 Vp-p composite video signal is supplied to pin 1 (1 Vp-p)of the RF converter through S1, pin 20, Q1530 and Q1532.

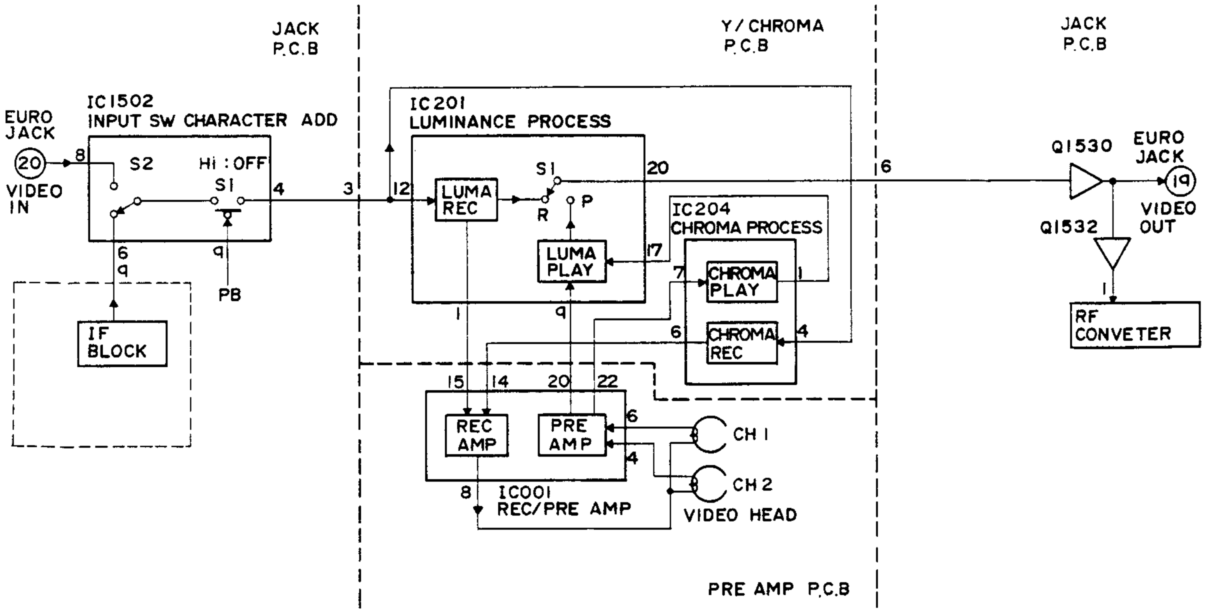

JACK P.C.B
Y/CHROMA P.C.B
JACK P.C.B
IC1502
INPUT SW CHARACTER ADD
EURO JACK
20
VIDEO IN
8
S2
Hi : OFF
S1
4
3
6
9
9
PB
IF BLOCK
IC201
LUMINANCE PROCESS
12
LUMA REC
S1
R
P
20
LUMA PLAY
17
IC204
CHROMA PROCESS
7
CHROMA PLAY
1
6
CHROMA REC
4
1
9
15
14
20
22
REC AMP
PRE AMP
6
4
CH 1
CH 2
8
IC001
REC/PRE AMP
VIDEO HEAD
PRE AMP P.C.B
16
Q1530
EURO JACK
19
VIDEO OUT
Q1532
1
RF CONVETER

Fig. 1-1 Simplified Video Signal Route

CHAPTER 2 LUMINANCE CIRCUIT

2-1 Luminance Recording

(1) General

Fig. 2-1 shows the main signal route for recording the luminance signal.

The luminance signal to be recorded is processed by IC201, located on the Y/chroma P.C.B. IC201 and IC206 also process the luminance signal in playback, so it is required to switch the signal routes. This selection command is given by the "PB5V" applied to pin 16 of IC201. The "PB5V" is Lo in the record mode and changes over the switches in IC201 to the "$\overline{\text{PB}}$" position to set IC201 to the record mode.

(2) AGC (Automatic Gain Control)

The AGC circuit controls the output level so that it is constant regardless of fluctuations in the input level of the video signal supplied from the video input jack or the video detector circuit in the IF block.

The video signal to be recorded is supplied to the AGC stage via pin 12 of IC201 (1 Vp-p). This unit adopts a keyed AGC system to detect the AGC control voltage. The video signal input to pin 12 is fed to the AGC detector via the AGC stage, S3, S5, IC201 pin 19, 3.6 MHz LPF CP203, delay equalizer CP204, pin 26, AMP 2 and the clamp circuit.

The clamp circuit fixes the sync tip level of the video signal which fluctuates according to the video contents and feeds the video signal to the AGC detector circuit in the next stage. The AGC detector receives an H. sync pulse from the sync separator, delays it and produces a keying pulse. Using this keying pulse, the AGC detector extracts a keyed pulse the amplitude of which is proportional to the amplitude of the sync pulse in the incoming video signal, and adds it to the horizontal blanking section (shown in Fig. 2-2 (e)). The AGC detector rectifies the compound signal with the keyed pulse added as shown in
Fig. 2-2(e) and generates a DC voltage at pin 11 which regulates the AGC gain. This AGC DC voltage is fed back to the AGC circuit in the initial stage and controls the video amplitude at the AGC stage output so that it is constant. The output level at pin 19 is approx. 1.0 Vp-p when the input level at pin 12 is between 0.5 Vp-p and 2 Vp-p.
The output from the AGC is supplied to CP203 3.6 MHz lowpass filter via S3, S5 and IC201 pin 19.

The output of the AGC is also supplied to the EURO jack and RF converter on the jack section via IC201 pin 20 (2 Vp-p) for monitoring the video.

(3) 3.6 MHz LPF and Delay Equalizer

The 3.6 MHz LPF circuit suppresses high frequency components of 3.6 MHz or more to get only the luminance signal and eliminate the chroma component (4.43 MHz ±500 kHz).

The delay equalizer delays the phase of the luminance signal by approx. 0.5 µs to

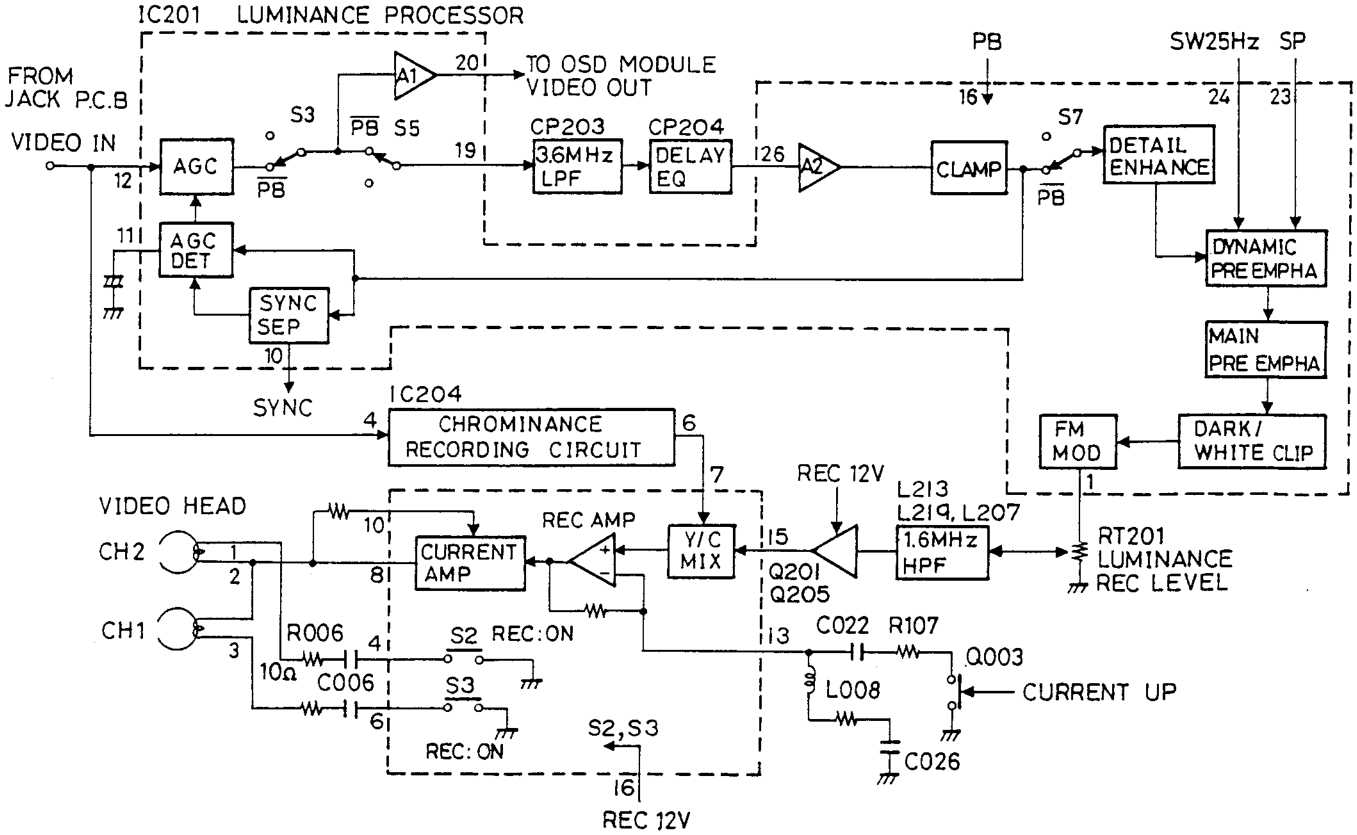

IC201 LUMINANCE PROCESSOR
FROM JACK P.C.B
VIDEO IN
12
AGC
S3
PB
$\overline{\text{PB}}$
S5
A1
20
TO OSD MODULE VIDEO OUT
19
CP203
3.6MHz LPF
CP204
DELAY EQ
26
A2
PB
16
CLAMP
S7
$\overline{\text{PB}}$
DETAIL ENHANCE
SW25Hz
SP
24
23
DYNAMIC PRE EMPHA
MAIN PRE EMPHA
DARK/ WHITE CLIP
FM MOD
1
11
AGC DET
SYNC SEP
10
SYNC
IC204
4
CHROMINANCE RECORDING CIRCUIT
6
7
VIDEO HEAD
CH2
CH1
1
2
3
10
8
CURRENT AMP
REC AMP
Y/C MIX
15
REC 12V
Q201
Q205
L213
L219, L207
1.6MHz HPF
RT201 LUMINANCE REC LEVEL
R006
10Ω
C006
4
6
S2 REC:ON
S3
REC: ON
S2,S3
16
REC 12V
13
C022
R107
Q003
L008
CURRENT UP
C026

Fig. 2-1 Luminance Recording Signal Route

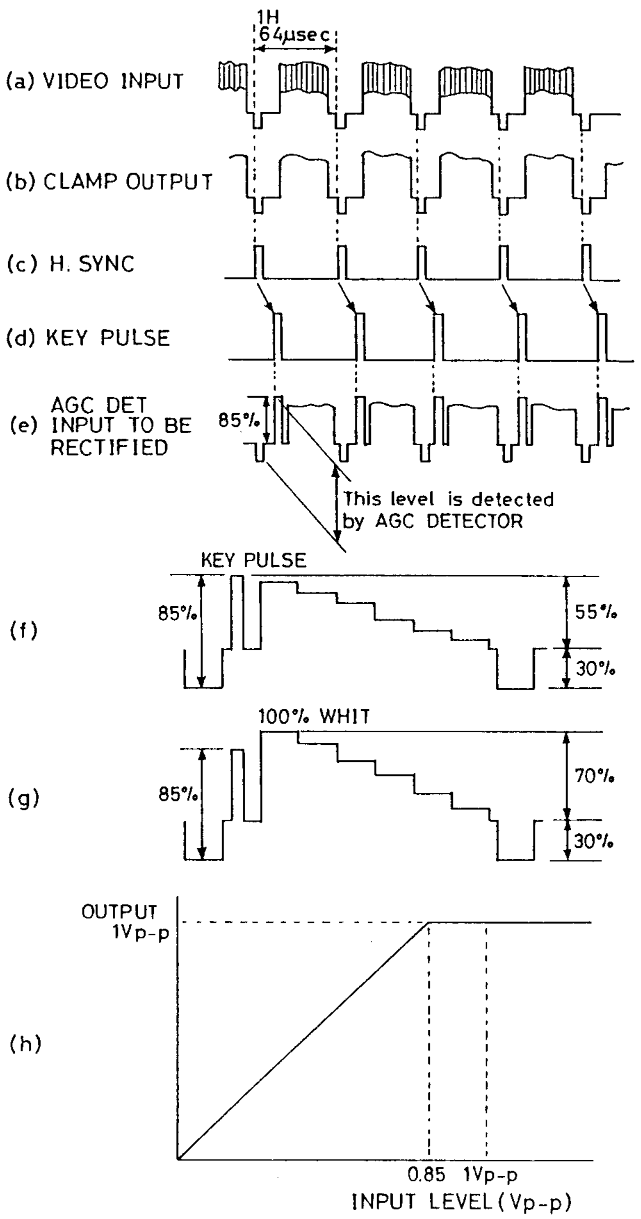


Fig. 2-2 Operation of AGC Detector

match the luminance phase with the chroma phase.

The output (0.6 Vp-p) from CP204 is sent to the clamp stage via buffer amp A2.

(4) Clamp Circuit

Since the DC component of the video signal is not transferred through capacitors, the sync tip level of a bright picture is not the same as the sync tip level of a dark picture. For the FM modulator to convert the sync level to the specified frequency 3.8 MHz, it is necessary to equalize the sync tip levels. The clamper stage aligns the level of each sync tip. The output of the clamp stage is branched to the detail enhancer and the sync separator.

(5) Detail Enhancer

Fig 2-3 shows the characteristics of the detail enhancer.

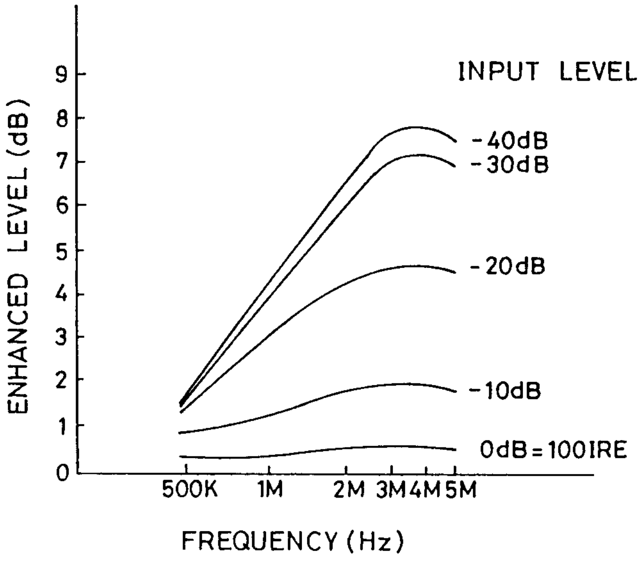


Fig. 2-3 Detail Enhancer

The detail enhancer enhances low-level high-frequency components (3 to 4 MHz) according to the input level during recording but does nothing during playback. As a result, overall response is enhanced in the high frequency band so that details of images like grass, hair, etc. become clear.

(6) Preemphasis Circuitry

The preemphasis circuitry is composed of dynamic preemphasis and main preemphasis stages. The purpose of these stages is to improve the S/N ratio of luminance signal. The FM modulated signal is likely to be affected by noise and the S/N of the luminance signal deteriorates as the frequency is higher. To improve the S/N of the luminance signal, the main preemphasis stage applies more emphasis to the luminance signal as the input signal frequency is higher, and the dynamic emphasis stage applies more emphasis to mid band frequency components as the input signal level is lower, before FM modulation. To make the overall frequency characteristics flat, main and dynamic deemphasis are applied to the demodulated video signal in the playback mode.

(7) Dynamic Preemphasis

To enhance the S/N of the playback video signal, the dynamic (nonlinear) preemphasis circuit enhances the mid band of the video signal (in the neighbourhood of 1 MHz) as shown in Fig. 2-4 corresponding to the video signal input level. This circuit can operate when the tape speed is LP in accordance with the VHS standard so pin 23 SP is "Lo".
The components enhanced in recording are attenuated in playback to make the overall frequency response flat.

The output of the dynamic (nonlinear) preemphasis circuit is supplied to the main preemphasis circuit.

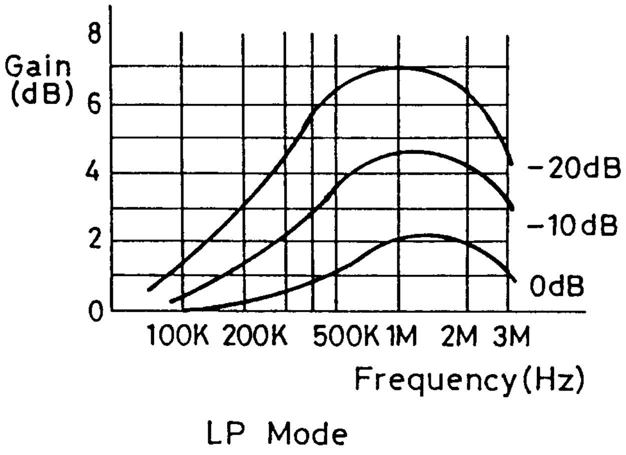


Fig. 2-4 Dynamic Preemphasis

(8) FM Interleave

When the tape speed is LP (in UK model), the video track to be recorded for the following field partially overlaps the adjacent video track recorded just before. In playback, as the video heads trace two tracks (the desired track and the adjacent track), beats occur due to the crosstalk between the two tracks. These beats can be made unnoticeable by offsetting the recording frequency by 1/2 fH for CH2 video head and generating the nominal frequency for the CH1 video head. To offset the recording frequency by 1/2 fH from field to field in the LP mode, the SW25Hz headswitching signal (5 Vp-p) is applied to the FM modulator stage via pin 24, the dynamic preemphasis, main preemphasis and dark/white clip stages. In the LP mode, as SP pin 23 is set to "Lo", it is possible for the SW25Hz to enter the dynamic preemphasis stage. FM interleaving is not used for SP recording since the video tracks do not overlap.

(9) Main Preemphasis

The dynamically emphasized luminance signal is sent to the main preemphasis circuit, where the high frequency components of the signal are boosted more than the low frequency components. The frequency response for the main preemphasis is shown in Fig. 2-5. Because, in the FM recording system, the noise of the playback signal increases in proportion to the frequency of the modulation signal, the boosting action is required for the high frequency components. In the playback process, the emphasized signal is deemphasized to restore the original frequency response of the signal. The output of the main preemphasis stage is sent to the dark and white clip stages.

(10) Dark and White Clip

When the luminance signal is emphasized by the preemphasis circuits, overshoots and undershoots occur at the leading and trailing edges of step waveforms in the luminance signal. When it is fed to the next FM modulator as it is, overmodulation occurs; to prevent this, this circuit clips overshoots and undershoots within specified levels. The overshoot level is set by the white clip circuit and the undershoot level by the dark clip circuit. Both clip levels have been adjusted to the optimum values in IC201 as shown in Fig. 2-6. The output of the dark and white clip stage is sent to the FM modulator.

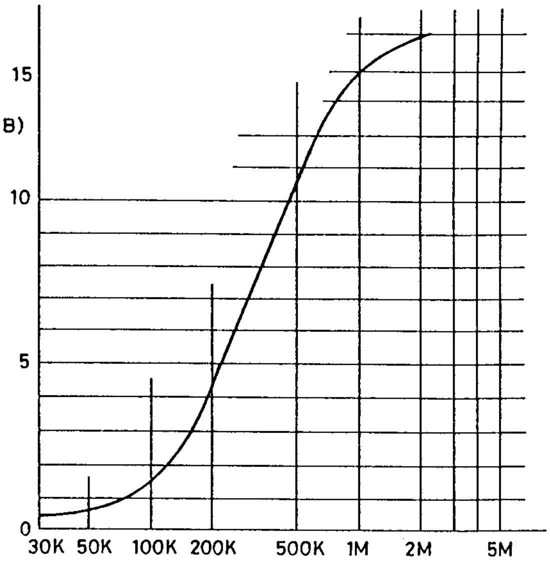


Fig. 2-5 Main Preemphasis

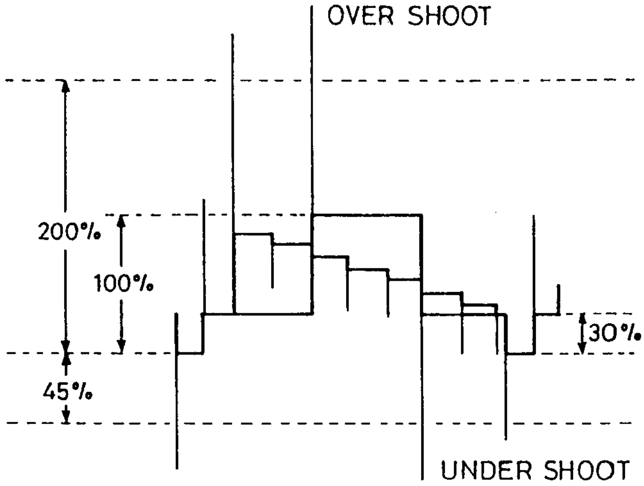


Fig. 2-6 Dark Clip and White Clip

(11) FM Modulator

The FM modulator consists of an astable multivibrator. This multivibrator generates a variable frequency square wave. The frequency of the square wave is governed by the level of the luminance signal at any given moment. Therefore, the processed luminance signal varies the frequency of the square wave, that is frequency modulation.

The FM modulator stage FM-modulates the multivibrator frequency so that the sync tip is converted to 3.8 MHz and the white peak to 4.8 MHz as shown in Fig. 2-7.

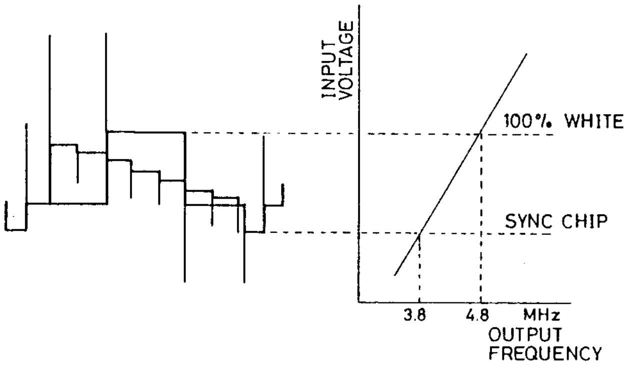


Fig. 2-7 **FM Modulation**

However, when the tape speed is LP, to reduce beat interference occurring in the playback mode, this carrier frequency is shifted by approx. 1/2fH (7.81 kHz) when recording CH2. The output (0.3 Vp-p) of the FM modulator is sent to the luminance record level adjustor.

(12) Recording Inhibition

Recording is stopped during the loading period just after recording has been instructed, the phase matching period just after the record pause mode has been released and the record pause period. This recording inhibit command is given from BIAS CONTROL pin 41 of system control μP IC901 via MUTE terminal 6C. Recording is inhibited by shutting down power supply line REC 12V. Fig. 2-8 shows the REC 12V generation circuit. In the record mode, system control μP IC901 outputs "Hi" via REC pin 5, and activates QR2502 and Q2501 to produce REC 12V. During above mentioned periods, to inhibit recording pin 41 BIAS CONTROL is set to "Hi" and QR2503 turns on. While QR2503 is on, QR2502 and Q2501 are inactive and the REC 12V is shut off, causing record amplifier Q204, Q205 and IC001 to be defeated and recording to be inhibited.

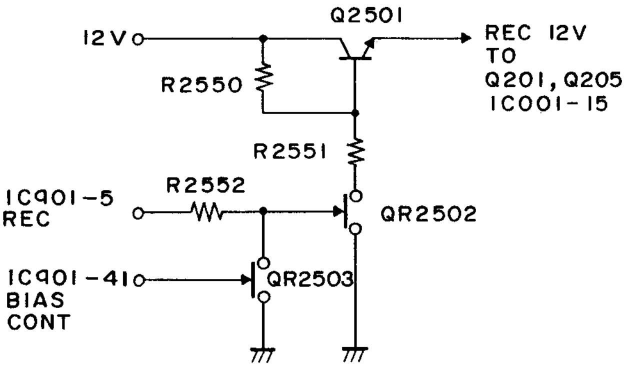


Fig. 2.8 **REC 12V Generator**

(13) Luminance Record Current Adjuster

The level of the FM luminance signal is adjusted by the recording current control RT201 (REC Y LEVEL), to the most suitable current for the video heads.

This adjustment is performed so that the current flowing through the video heads is approx. 20 mAp-p.

(14) High Pass Filter L213, L219, L207

When the carrier of the FM modulator swings between 3.8 MHz and 4.8 MHz, sidebands are also produced.

The lower sideband extends down to 500 kHz (and below). When recording the chroma signal, the lower FM sideband with the same frequency band as the chroma must be removed to prevent chroma beats occurring in playback. This is accomplished by the high pass filter consisting of L213, L219 and L207. The high pass filter attenuates the luminance signal lower sideband under 1.6 MHz as shown in Fig. 2-9.

C234, L207 and C235 provided before record amp Q204 form a lowpass filter. This lowpass filter also eliminates the upper sideband components (8 MHz or more) in the FM modulated luminance signal to prevent beat interference occurring in playback.
The output of the lowpass filter is sent to the preamplifier/record amplifier P.C.B via amplifiers Q204 and Q205 (0.6 Vp-p).

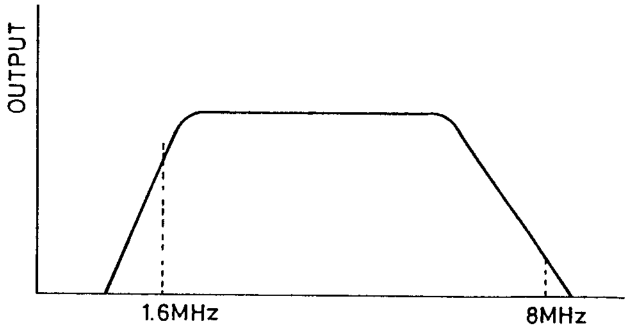


Fig. 2-9 **Band Response of Highpass Filter**

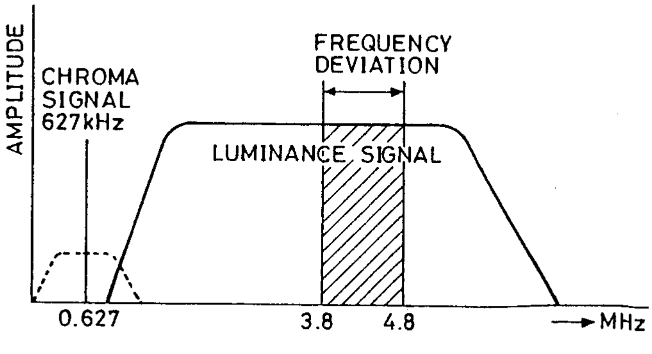


Fig. 2-10 **Composition of Recording Signal**

(15) Y/C Mixer and Recording Amplifier

Both the FM luminance signal and the 627 kHz chroma signal are recorded together on the tape, so they must be mixed before entering the final amplifier.

The chroma signal sent from the chroma recording processor IC204 is adjusted to the optimum level by RT203 and sent to the Y/C mixer stage via IC001 pin 13. The Y/C mixer adds the chroma recording signal to the FM luminance signal and feeds the totalled recording signal to the recording amplifier (See Fig. 2-1). Fig. 2-10 shows the configuration of the recording current.
The recording amplifier amplifies the recording signal and applies the optimum recording current to the video heads via the current amplifier stage.
Pin 12 is provided to switch the gain of the recording amplifier. At the start of recording or after a recording pause mode has been released, the CURRENT-UP signal is applied for 7 (14 sec for LP) seconds to suppress rainbow noise. When the CURRENT-UP signal is applied to Q003, as Q003 turns on, the gain of the recording amplifier is increased by about 20% which raises the record current to erase the signal recorded previously. L008 and C026 boost lower sideband components to optimize the frequency characteristics of the recording current. The current amplifier is composed of a push-pull amplifier and converts the incoming voltage to current. Pins 10 and 11 are provided to feed back the DC voltage, and stabilize the operating voltage of the current amplifier.

(16) Path of Recording Current

The recording current of the CH2 video head flows through pin 9, PG001-2, CH2 video head, PG001-1, R006, C006, pin 5 and S3. S3 and S4 are turned on by the voltage, REC 12V, applied at pin 15. The signal (0.2 Vp-p) generated across R006 is used to check the recording current.

2-2 Luminance Playback

(1) General

During playback, the luminancae signal is processed in pre/rec amp IC001 and luminance processor IC201 the same as in recording. "REC12V" is set to Lo and "PB5V" to Hi in this mode, so switches in IC201 are changed over to the PB position and the signal route for playback is formed. Each circuit operation is described in the following in the order of the signal route.

Fig. 2-11 shows the preamplifier circuit and Fig. 2-13 the main route of the luminance signal in the playback mode.

(2) CH1, CH2 and CH3 Preamplifiers

The CH1 and trick play heads and the CH2 head pick up the weak FM luminance signal (approximately 0.3 mVp-p) together with the chroma signal, when they are in contact with the tape. Switch S5, controlled by the voltage at pin 16 PB 5V, grounds one end of each video head in the playback mode. CH1, CH2 and CH3 preamplifiers amplify the weak playback signal and supply it to the channel switch S1.

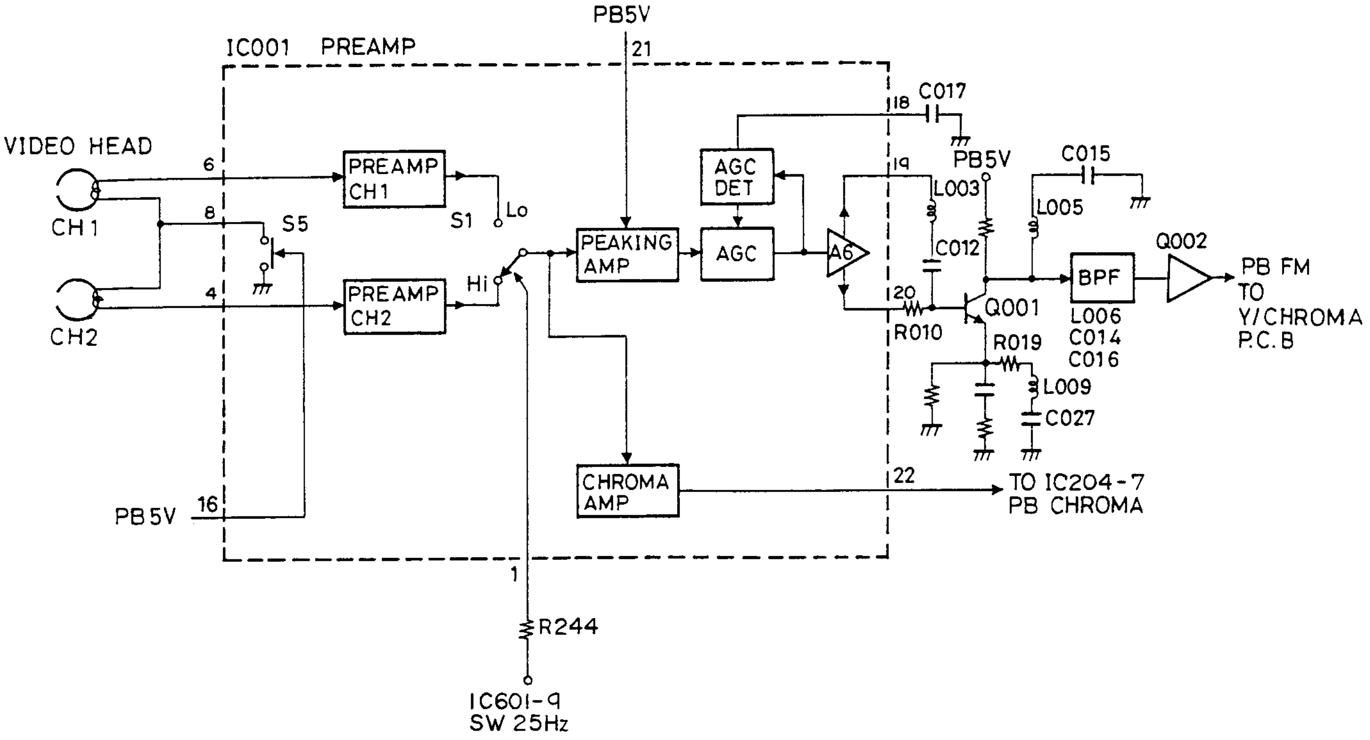


Fig. 2-11 Preamplifier

(3) Channel Switch

The channel switch S1 produces a continuous playback FM signal (including chroma signal) while switching the outputs of the CH1, CH2 and CH3 preamplifier stages using a head switching pulse (SW25Hz). The head switching pulse (SW25Hz: 5 Vp-p) is generated in the servo circuit and is supplied to the channel switch S1 via IC001 pin 1. S1 selects the output of the CH1 preamplifier when the level of the head switching pulse is "Lo", the CH2 preamplifier output when the level is "Hi" and the CH3 preamplifier output when the level is "Mid". The Mid level at pin 1 is set by the trickplay control IC604. In the trick play mode, IC604 pin 1 outputs "Hi", and this is divided by D207, R232 and R214 to produce the "Mid" level. This Mid level is combined with the SW25Hz, alternated between Hi and Lo, at the emitter of Q211, and Q211 produces a switching pulse altenated between Mid and Hi.
As a result, in the trickplay mode, switch S1 selects the output of the CH2 or trickplay head, and selects the output of the CH1 or CH2 video head in the normal playback mode.

The output of the channel switch is sent to the peaking and chroma amp stages. The peaking amp operates as an ordinary amplifier, because it has no resonant circuit for its load at pin 21.

(4) AGC

The AGC stage regulates the output level so that it is constant regardless of fluctuations in input level, and prevents flickering due to level differences in the FM signal from field to field.
The AGC output is fed to the AGC detector stage where the FM signal amplitude is detected and charged to C017 connected to IC001 pin 17 and averaged. The capacitance of C017 is such a value that the AGC control voltage responds quickly enough to level changes occurring every 1/50 sec, but does not respond to level changes with a shorter period such as dropout. This detected AGC control voltage is fed back to the AGC stage to make its output constant.
The AGC stage output is applied to the phase compensator.

(5) Phase Compensator

The phase compensator corrects phase distortion occurring in the FM signal in the 5 MHz peaking circuits (Q001, Q201), in the following stage, so that the video signal is not distorted in FM demodulation. The phase is corrected by the resonant circuit composed of L003, C012, R010 and an amplifier A6 contained in IC001.

The output (0.2 Vp-p: pin 19) of the phase compensator is supplied to the 5 MHz peaking circuit.

(6) 5 MHz Peaking Circuit

5 MHz peaking circuits are provided at the emitters of Q001 and Q201 as shown in Figs. 2-11 and 2-12 and boost the 5 MHz component of the playback FM signal by a total of approximately 13 dB. The purpose

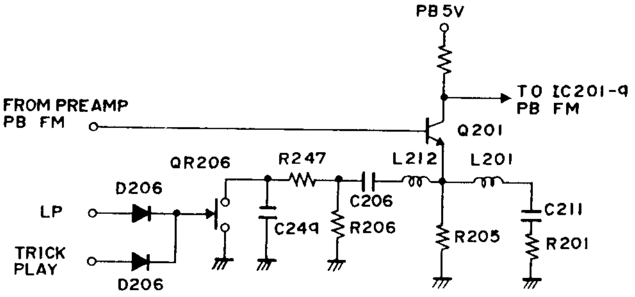

PB 5V
FROM PREAMP
PB FM
TO IC201-9
PB FM
Q201
QR206
R247
L212
L201
D206
C206
C211
LP
C249
R206
R205
R201
TRICK
PLAY
D206

Fig. 2-12 Peaking

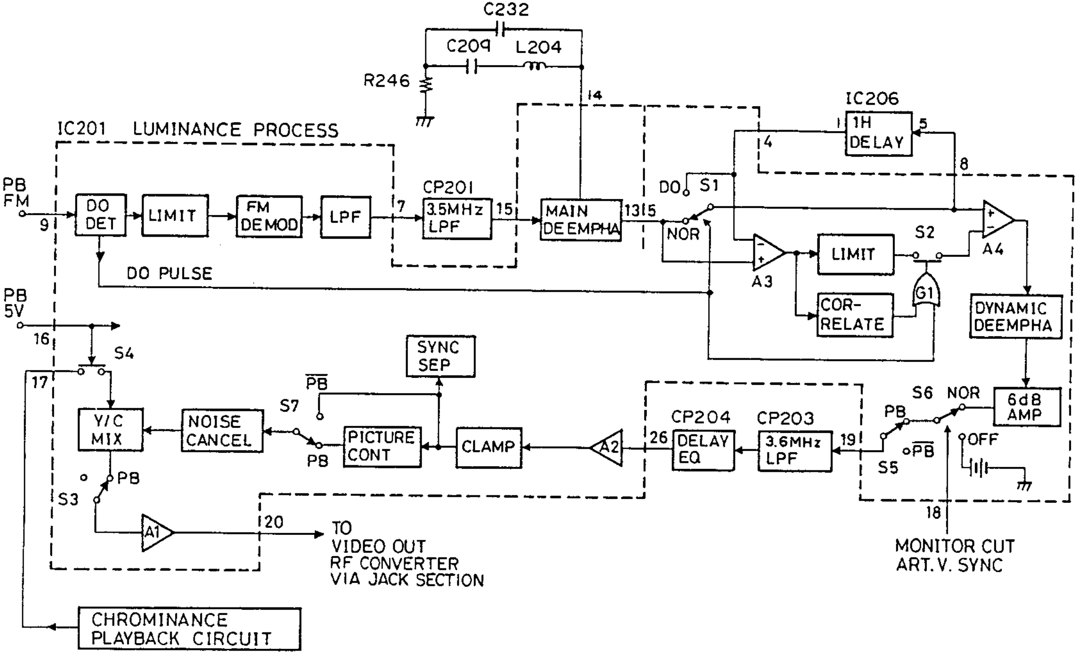

C232
C209
L204
R246
IC206
14
1H
DELAY
1
5
4
8
IC201 LUMINANCE PROCESS
PB
FM
9
DO
DET
LIMIT
FM
DEMOD
LPF
7
CP201
3.5MHz
LPF
15
MAIN
DEEMPHA
13
15
DO
S1
NOR
S2
A4
A3
LIMIT
DO PULSE
G1
COR-
RELATE
DYNAMIC
DEEMPHA
PB
5V
16
S4
17
SYNC
SEP
PB
S7
Y/C
MIX
NOISE
CANCEL
PB
PICTURE
CONT
CLAMP
A2
26
CP204
DELAY
EQ
CP203
3.6MHz
LPF
19
S6
NOR
PB
6dB
AMP
PB
OFF
S5
PB
S3
A1
20
TO
VIDEO OUT
RF CONVERTER
VIA JACK SECTION
18
MONITOR CUT
ART. V. SYNC
CHROMINANCE
PLAYBACK CIRCUIT

Fig. 2-13 Luminance Signal Playback Route

of the 5 MHz peaking circuits is to compensate so that the overall playback frequency characteristics from the heads to the 5 MHz peaking circuits is flat. The playback frequency response of the video signal picked up by the CH1 and CH2 video heads is as shown by curve (A) in Fig. 2-14.

The frequency response of the preamplifier circuit is as shown by curve (B) and is flat. The total frequency response of the 5 MHz peaking circuits should be made as shown by curve (D) so that the integrated frequency response shown by curve (C) is obtained finally.

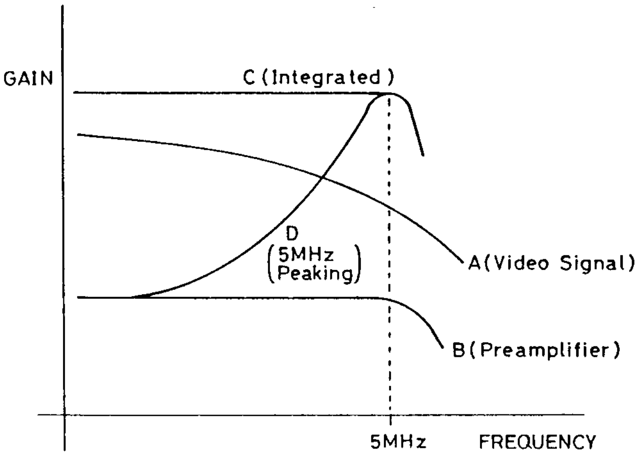


Fig. 2-14 Frequency Response of Peaking Circuit

The output of the first 5 MHz peaking circuit is supplied to the highpass filter composed of L005, L006 and capacitors. The highpass filter removes the chroma component 627 kHz and high frequency luminance components 8 MHz or more which could cause beats. The output (0.3 Vp-p) of the highpass filter is sent to the second 5 MHz peaking circuit on the Y/chroma P.C.B via buffer amp Q002. QR206 provided at the second 5 MHz peaking circuit turn on when the playback speed is LP or the operation mode is trick play. This makes the resonance frequency and Q of the peaking circuit lower and makes the noise appearing on the screen inconspicuous in the LP and trick play modes. (LP speed is provided in the VT-M622E(UK))

(7) Dropout Detector

The dropout detector detects missing playback FM signals caused by tape scratches or dirt on tape or heads. (See Fig. 2-13.) The dropout detector accepts a 0.6 Vp-p playback FM signal from Q201. First, the detector removes small variations of the FM envelope with a limiter contained in the detector, and then detects large level changes of the envelope that is dropout pulse by rectifying the FM envelope. The detected dropout pulse is sent to the dropout compensation circuit to compensate for missing parts of the FM signal.

(8) Limiter

The limiter circuit removes amplitude variations in the FM signal. In recording, when the FM carrier is modulated strongly, the FM carrier level becomes smaller than that of the lower sideband at the high modulation section, and it causes black/white inversion in playback. To prevent black and white inversion, after high frequency components of the FM signal have been boosted the limiter limits the amplitude of the FM signal to make it flat.

(9) FM Demodulator

The luminance signal was FM-modulated so that its sync tip was 3.8 MHz and its white peak was 4.8 MHz in recording. In playback the FM demodulator circuit demodulates it to the original base band video signal.

The FM demodulator circuit is composed of a pulse delay circuit and multiplier as shown in Fig. 2-15. The FM demodulator circuit first converts the FM signal to a pulse the duty ratio of which is inversely proportional to the input FM signal frequency using a delay stage and a multiplier. That is, it converts the FM signal to a pulse signal whose duty raio varies. Next the circuit smooths this pulse signal to demodulate the base band video signal.

The output (1 Vp-p including FM component: pin 7) of the FM demodulator is sent to the main deemphasis stage via lowpass filters.

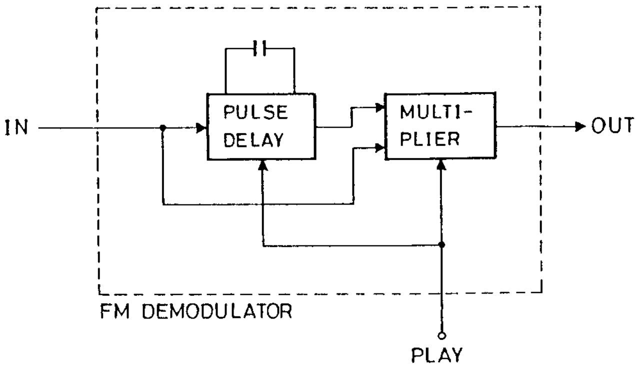


Fig. 2-15 (a) FM Demodulator

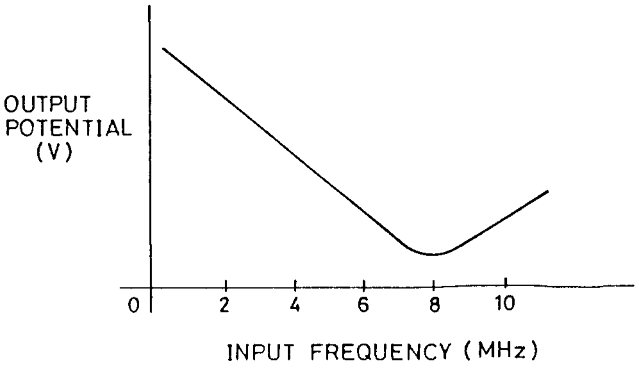


Fig. 2-15 (b) Demodulator Characteristics

(10) Lowpass filter, 3.5 MHz Lowpass filter

The lowpass filter integrated in IC201 and 3.5 MHz lowpass filter CP201 remove FM carrier components remaining in the demodulated luminance signal. The output of the lowpass filter is sent to the main deemphasis stage via IC201 pin 15 (0.3 Vp-p negative polarity).

(11) Main Deemphasis

The main deemphasis stage has reverse frequency characteristics to the main preemphasis circuit which boosted high frequency components in recording, and attenuates the high frequency components to restore flat overall frequency characteristics. L204,C209 and C232 attached at pin 14 boost high frequency components around 2.8 MHz to enhance the resolution.
The output of the main deemphasis stage is sent to the vertical processor via pins 13 and 5 (0.6 Vp-p positive polarity).

(12) Vertical Processor

To improve the S/N of the luminance signal, a line correlative noise canceller using a 1H CCD delay IC is employed in this unit. This noise canceller averages the sum of the original playback signal and 1H delayed playback signal to reduce non-correlative noise such as white noise.
Fig. 2-16 shows the configuration of the vertical processor. This circuit also works as a dropout compensator. The demodulated luminance signal enters pin 5 of IC201 (0.6 Vp-p: positive) and is applied to the 1H delay IC via S1 and pin 8, where the luminance signal is delayed by 1H and proceeds to the negative input pin of operational amplifier A3 via pin 4 (0.6 Vp-p). The operational amplifier A3 also receives the original luminance signal at its positive input pin and detects the difference between the original signal and the delayed signal. This difference (designated D) consists of non-correlative noise components (white noise with low level) and the

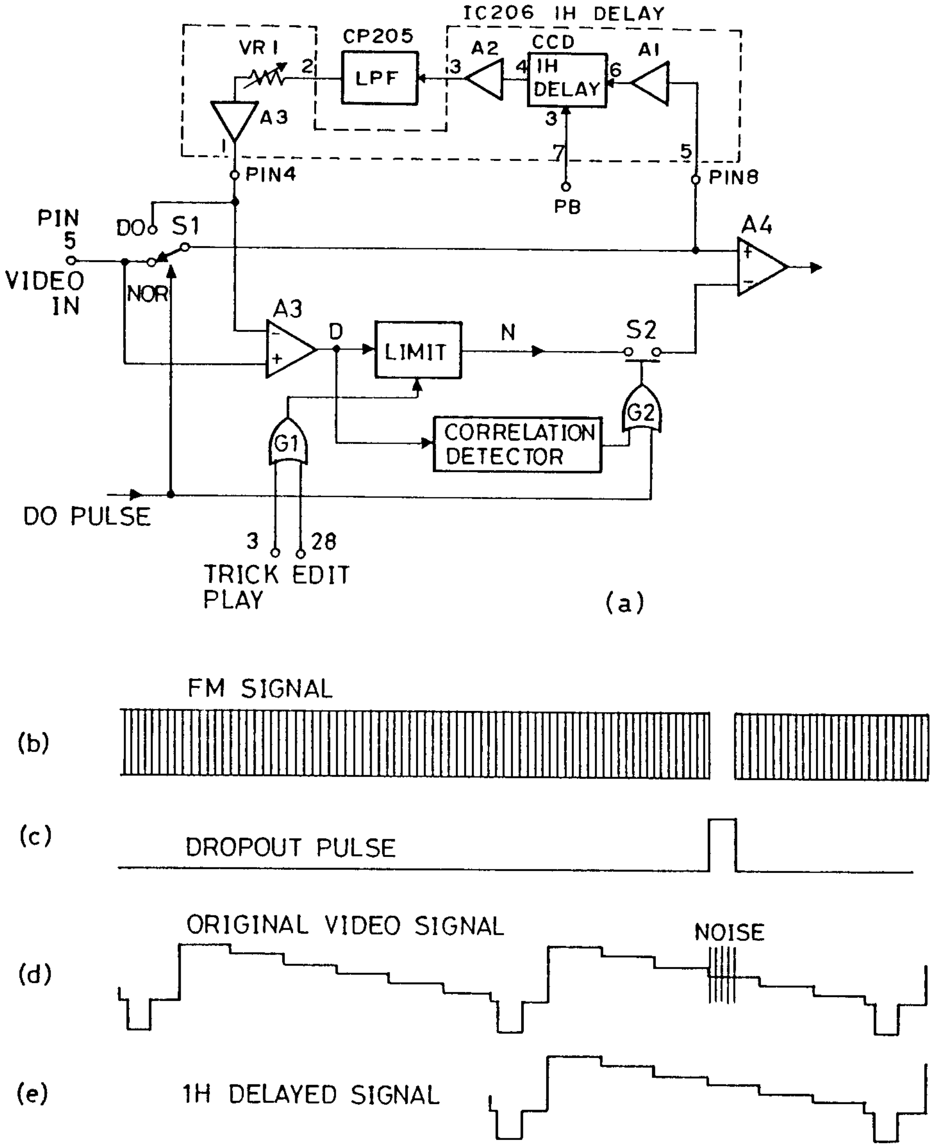

IC206 1H DELAY
VR1
CP205
LPF
A2
CCD
1H DELAY
A1
A3
2
3
4
6
3
1
7
5
PIN4
PIN8
PB
PIN 5
VIDEO IN
DO
S1
NOR
A4
A3
D
LIMIT
N
S2
G2
G1
CORRELATION DETECTOR
DO PULSE
3
28
TRICK PLAY
EDIT
(a)
FM SIGNAL
(b)
(c)
DROPOUT PULSE
(d)
ORIGINAL VIDEO SIGNAL
NOISE
(e)
1H DELAYED SIGNAL

Fig. 2-16 Vertical Processor and Dropout Compensator

luminance signal without vertical correlation (edge components with high level). The difference D is applied to the limiter which passes low level components and blocks high level components, thus the white noise components (designated N) are extracted. Receiving the white noise and luminance signal, the operational amplifier A4 removes the white noise contained in the original luminance signal by subtracting the white noise from the original signal. As a result, the S/N of the luminance is improved by approximately 3 dB. CP205 lowpass filter removes the clock component contained in the delayed video and sends its output (1 Vp-p) to level adjustor VR1 integrated in IC206. Level adjustor VR1 adjusts the amplitude of the 1H delayed video signal to match it to that of the original video signal (0.6 Vp-p).
The correlation detector CORRELATE detects large differences between the original signal and delayed signal. A large difference is considered to be a real variation in the video signal and not noise. So when a large difference is detected, the correlation detector outputs a pulse to turn off switch S2, defeating the vertical processing function to assure good resolution.
In the trick play and edit modes (Not provided in VT-M620E series), to reduce irregular noise and to enhance resolution, "Hi" is applied to limiter via pins 3 and 28 to defeat the vertical processor.

(13) Dropout Compensator

To prevent dropout noise from appearing on the screen, the dropout compensator replaces the dropout noise, occurring at the missing parts of the playback FM signal, with a clear video signal 1H before the dropout.
Fig. 2-16 shows the dropout compensator. When there is no dropout, switch S1 selects the luminance signal applied to pin 5 and outputs it via operational amp A4. Another input pin of switch S1 receives the 1H delayed luminance signal processed via 1H delay IC IC206 and lowpass filter CP205.
When the FM signal is missing, the dropout stage detects it and produces a dropout pulse and applies it to S1 and S2. By this, S1 is switched to the dropout side (DO), and the 1H delayed luminance signal which was derived from the luminance signal 1H before the dropout occurred is output to the operational amplifier A4.
Thus the dropout noise is compensated. Switch S2 is also turned off by the dropout pulse to defeat the vertical processing when a dropout has occurred.
The luminance signal with dropout compensated is sent to the dynamic deemphasis stage.

(14) 1H Delay circuit

Fig. 2-17 shows the configuration of the 1H delay circuit.
This circuit consists of 1H delay IC IC206 and 3.5 MHz lowpass filter CP205.
The 1H delay IC incorporates a clock

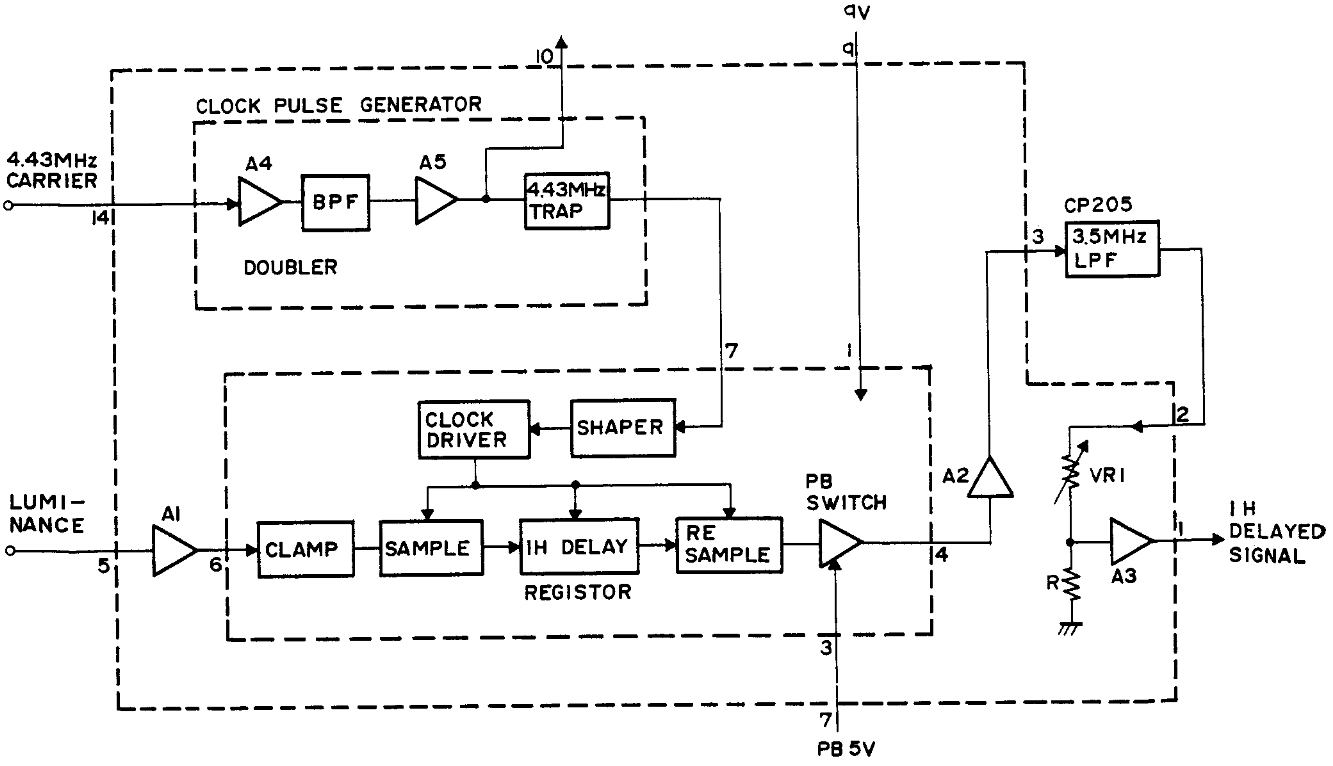


Fig. 2-17 1H Delay Circuit

pulse generator, 1H delay charge coupled device, level adjustor VR1 and three buffer amps. The clock pulse generator accepts a 4.43MH carrier signal (0.25 Vp-p) from chroma processor IC204 and doubles the input frequency. Amplifier A4 amplifies the 4.43 MHz carrier signal and sends it to amplifier A5 via the 4.43 MHz band pass filter. A5 is a nonlinear amplifier and produces a 8.86 MHz frequency component of twice the input frequency. The produced 8.86 MHz frequency component is passed through the 4.43 MHz trap and is applied to 1H delay CCD via pin 7. The unnecessary 4.43 MHz carrier component is removed by the trap. The luminance signal applied to pin 6 of 1H delay CCD via buffer amp A1 is clamped at the clamper and sampled at a period of 1/8.86 MHz at the sampling stage and is applied to the 1H delay stage. The 1H delay stage is composed of 563 serial registers which store the sampled luminance signal momentarily. The sampled luminance signals are transferred one by one from one register to the next with the period of the clock pulse. Since it takes approximately 64 µsec for the sampled luminance signal to move across the 563 resisters, the luminance signal is delayed by 1H by the 1H delay stage. The resampling stage takes up the 1H delayed signal and outputs it (2 Vp-p) via the playback switch to the lowpass filter, where the clock pulse component is filtered out, and 1H delayed luminance signal (1 Vp-p) is developed.
CP205 lowpass filter removes the clock component contained in the delayed video and sends its output (1 Vp-p) to level adjustor VR1 integrated in IC206. Level adjustor VR1 adjusts the amplitude of the 1H delayed video signal to match it to that of the original video (0.6 Vp-p).

(15) Dynamic Deemphasis

The dynamic preemphasis circuit varies the emphasis amount of mid band frequency components of the recording signal according to the recording signal level in recording. The dynamic deemphasis stage is provided with the reverse characteristics to that of the dynamic preemphasis circuit.
That is, this stage varies the attenuation amount of the mid band frequency components of the playback signal according to the playback signal level so that the overall frequency characteristics becomes flat.
The dynamic deemphasis stage operates when the tape speed is LP and so pin 23 is "Lo".
The output from the dynamic deemphasis circuit is sent to monitor cut switch S6.

(16) Monitor Cut Switch

The monitor cut switch S6 outputs a DC voltage the level of which is the same as that of sync tip to black out the screen while pin 18 is "Hi". During loading, "Hi" is applied to pin 18, and the switch S6 mutes the playback video signal.

In the trick play mode, a positive artificial "V. SYNC" pulse, the pulse width of which is 5H, is applied to pin 18, and the switch S6 outputs a voltage equal to the sync tip level to insert the artificial V. sync into the playback video signal. The artificial V. SYNC is supplied from the servo circuit.

The output of the monitor cut switch is sent to 3.6 MHz LPF CP203 via pin 19 (1.4 Vp-p).

(17) 3.6 MHz LPF, Delay Equalizer

The 3.6 MHz LPF CP203 passes only the luminance signal of 3.6 MHz or less and the delay equalizer (CP204) corrects the phase differences between the luminance signal and chrominance signal. The output of the delay equalizer (0.7 Vp-p) is sent to the picture control stage and sync separator via the clamper stage.

(18) Edge Enhancer (Picture Control)

This stage emphasizes the edges of picture using a quadratic differentiation circuit which is composed of two linear differentiation circuits. Fig. 2-18 shows how the edge enhancer operates with a square wave applied. The incoming signal is split into the LPF and sync removal stage. The sync removal stage removes the sync section so the sync section is not processed. The square-wave signal is then differentiated by the first linear differentiation circuit and becomes the waveform shown in (C). The waveform (C) is again differentiated by the second linear differentiation circuit to become the edge emphasis signal shown by waveform (D). The gain control stage adjusts the amplitude of the edge emphasis signal according to the voltage at pin 2 and applies it to the subtracter stage. Receiving the luminance signal (B) from the LPF and edge emphasis signal (D) from the gain control stage, the subtracter combines the two signals, and creates an edge emphasized luminance signal as shown in (E). The LPF delays the luminance signal to match the phases of both signals. The picture control voltage at pin 2 is regulated by the picture control PWM signal output from the timer µP. The PWM signal is inverted by QR1510 and smoothed by the lowpass filter consisting of R2540, R2541, and C2528 to become the picture control DC voltage. The duty ratio of the PWM signal can be regulated in 64 steps by operating the slow speed up/down input switches provided on the remote control hand unit. When the edit switch (not provided in VT-M620E series and provided in VT-VT630E series) at the back of the unit is set to on for dubbing, the picture control PWM signal is disabled by the application of logic "Hi", and a constant voltage is applied to pin 2 to output an edge emphasized signal. In the record mode QR203 grounds the EDIT line to stop this function.

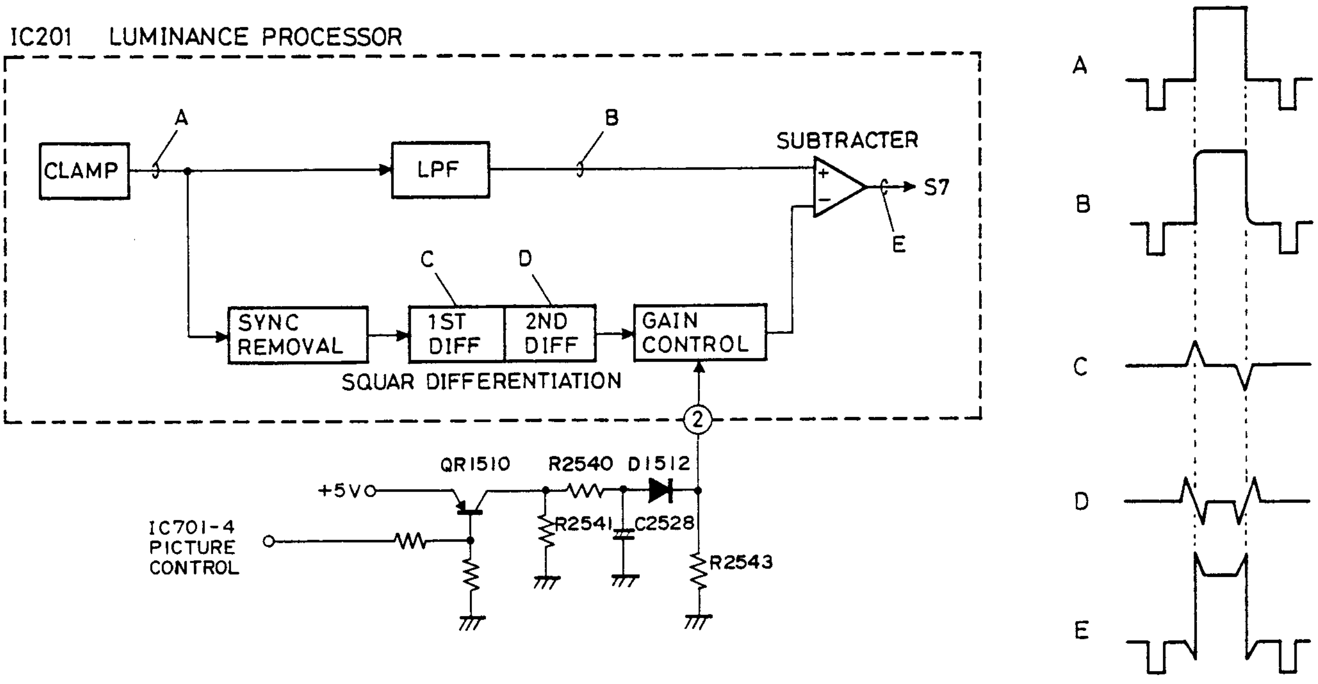

IC201 LUMINANCE PROCESSOR
CLAMP
A
LPF
B
SUBTRACTER
S7
E
C
D
SYNC REMOVAL
1ST DIFF
2ND DIFF
GAIN CONTROL
SQUAR DIFFERENTIATION
2
QR1510
R2540
D1512
+5V
IC701-4 PICTURE CONTROL
R2541
C2528
R2543
A
B
C
D
E

Fig. 2-18 Edge Enhancer (Picture Control)

(19) Noise Cancel

The noise cancel stage removes the white noise which is composed of high frequency components with small amplitude contained in the luminance signal. This stage removes the high frequency components with small amplitude to improve the signal-to-noise ratio.

The output of the noise cancel stage is supplied to the Y/C mixer stage.

(20) Y/C Mixer

The Y/C mixer combines the luminance signal and the playback chroma signal (0.45 Vp-p) supplied from IC204 chroma processor via IC201 pin 17, and produces a composite video signal. The output of the Y/C mixer stage is fed to the video output socket and RF converter via pin 20 (2 Vp-p) and the jack section. The signal route hereafter has been described in the previous section.

CHAPTER 3 CHROMINANCE CIRCUIT

3-1 Chrominance Recording

(1) General

Fig.3-1 shows the main route of the chroma signal in the record mode.

During recording, the chroma signal is processed by IC204 located on the Y/Chroma P.C.B. IC204 also processes the chroma signal during play, so it is required to switch over the signal routes. The switching command is given by the "PB5V" supplied via pin 20. The "PB5V" is set to Lo during recording, the switches inside IC204 are set to the "$\overline{\text{PB}}$" position and the signal route for recording is formed. The operation of each stage is described in the order of the signal route as follows.

(2) Input Select Switch S3

The video signal (0.9 Vp-p) fed from the video input jack or IF/video detector is supplied to the input select switch S3 via IC204 pin 4. The route from the ACC stage to the BPF (CP208) in IC204 is used in common for recording and playback, so the input select switch S3 selects the signal input to this circuit. In the record mode, S3 selects the video signal at pin 4 and supplies it to the ACC stage. (chroma component: 0.15 Vp-p).

(3) ACC (Automatic Colour Gain Control)

The ACC stage is provided so that the chroma recording level is always constant regardless of fluctuations in the input level of the chroma signal. Fig. 3-2 shows the operation of the ACC.
The output of the 1.5 MHz lowpass filter and the burst gate pulse are supplied to the ACC detector stage. The ACC detector extracts the chroma burst signal using the gate pulse and rectifies the burst signal into a gain control DC voltage. The detected ACC control voltage is fed back to the ACC stage, where its gain is regulated so that the output amplitude of the 1.5 MHz lowpass filter is constant.

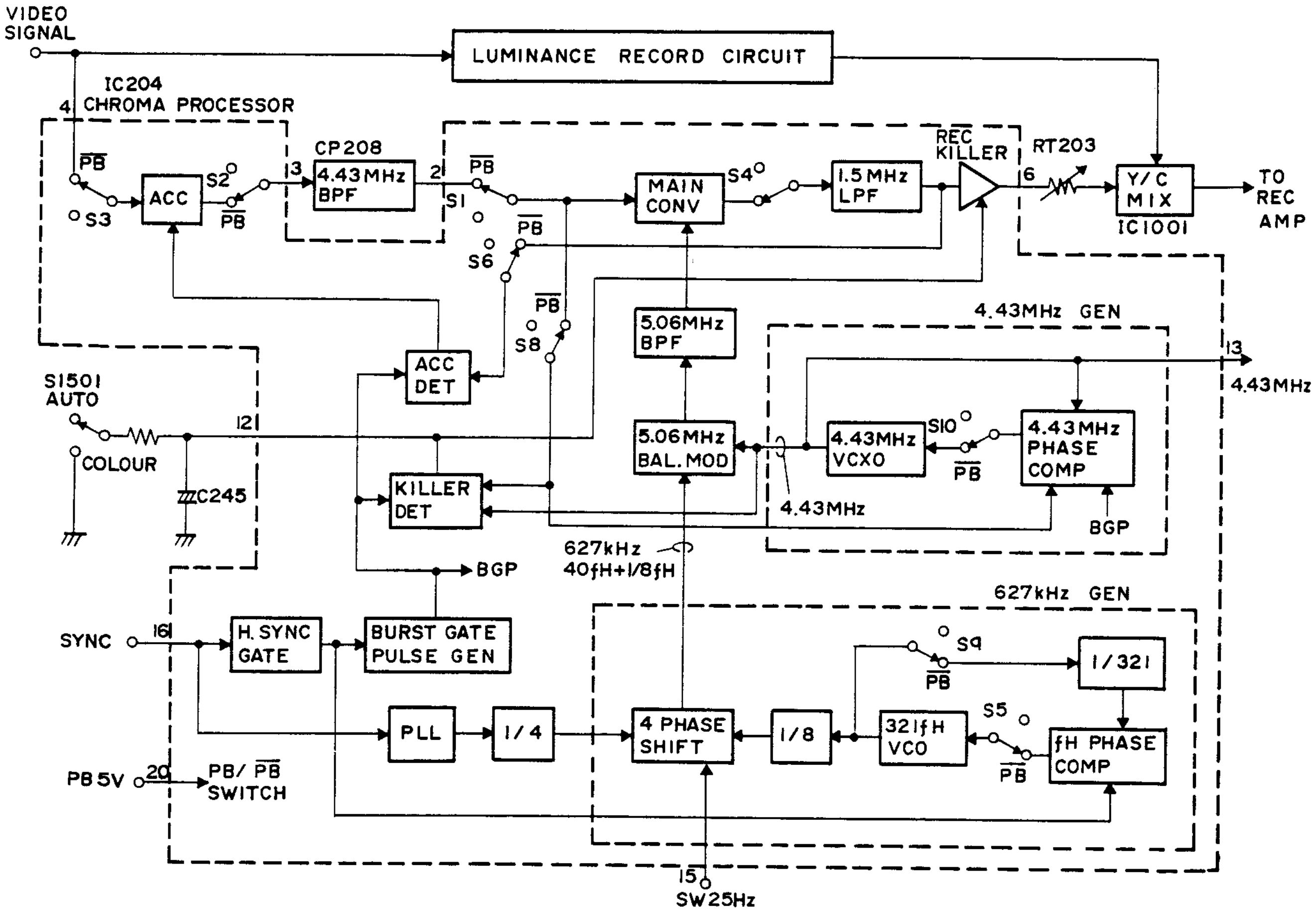
The output of the ACC stage is fed to the 4.43 MHz bandpass filter via PB/$\overline{\text{PB}}$ switch S2.

(4) 4.43 MHz Band Pass Filter

The 4.43 MHz bandpass filter passes only the chroma signal (4.43 MHz ±500 kHz) in the video signal supplied from the PB/$\overline{\text{PB}}$ SW S2.
The output of the BPF is supplied to the main converter stage via IC204 pin 2 (0.12 Vp-p) and PB/$\overline{\text{PB}}$ switch S1.

(5) H. Sync Gate

The H. SYNC gate eliminates the equalizing pulse contained in the H. sync



VIDEO SIGNAL
LUMINANCE RECORD CIRCUIT
IC204 CHROMA PROCESSOR
4
PB
S3
ACC
S2
PB
3
CP208
4.43MHz BPF
2
PB
S1
PB
S6
MAIN CONV
S4
1.5MHz LPF
REC KILLER
RT203
6
Y/C MIX
IC1001
TO REC AMP
PB
S8
ACC DET
5.06MHz BPF
4.43MHz GEN
13
4.43MHz
S1501 AUTO
COLOUR
12
C245
KILLER DET
5.06MHz BAL. MOD
4.43MHz VCXO
S10
PB
4.43MHz PHASE COMP
4.43MHz
BGP
627kHz
40fH+1/8fH
BGP
627kHz GEN
SYNC
16
H. SYNC GATE
BURST GATE PULSE GEN
S9
PB
1/321
PLL
1/4
4 PHASE SHIFT
1/8
321fH VCO
S5
PB
fH PHASE COMP
PB5V
20
PB/ PB SWITCH
15
SW25Hz

Fig. 3-1 Chrominance Signal Recording Route

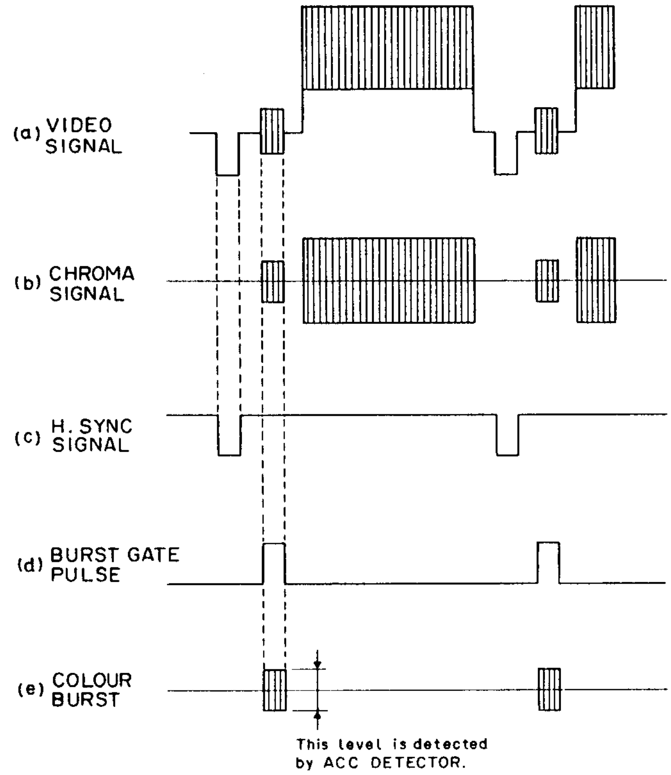


Fig. 3-2 Operation of ACC

signal supplied from IC201 pin 10 (5 Vp-p), and supplies only the H. sync signal to the burst gate pulse generator, record 321fH phase comparator, frequency discriminator (in PB) and 4-phase shifter, etc.

(6) Burst Gate Pulse Generator

Receiving the H. sync signal from the H.sync gate, the burst pulse generator delays the H. sync signal to create the burst gate pulse. The phase and width of the burst gate pulse must be such that only the burst signal is gated from the chroma signal.

(7) Main Converter

The purpose of the (record) main converter, consisting of a balanced modulator, is to produce a 627 kHz down-converted recording chroma signal having rotating phase in accordance with the VHS format.

To rotate the phase of the output of the main converter, the local oscillator signal must have phase rotation, and to down-convert the chroma frequency, the frequency of the local oscillator must be the sum of 4.43 MHz (input) and 627 kHz (output).
Therefore, a continuous 5.06 MHz phase-rotated signal is applied to the main converter as the local oscillator signal.

The phase of the 5.06 MHz signal is delayed by 90° every line, 64μs, when the CH2 chroma signal is recorded, and is maintained constant when the CH1 chroma signal is recorded. As a result, the output of the main converter has the same phase rotational characteristics as the local oscillator signal.

The (record) main converter mixes the chroma signal (4.43 MHz ±500 kHz) fed from the 4.43 MHz bandpass filter and the phase rotational 5.06 MHz carrier signal fed from the 5.06 MHz balanced modulator(sub-converter). The output contains the sum and difference frequency components of the two input frequencies. The sum is a 9.49 MHz rotational chroma signal and the difference is the required 627 kHz rotational chroma signal. The down-converted chroma signal (627 kHz ±500 kHz) which is the difference component is taken up by the 1.5 MHz LPF in the next stage.

(8) Record Colour Killer

The record colour killer stage enables or disables the recording chroma signal to conduct by detecting the presence or absence of the chroma signal. The killer detector stage controls the recording colour killer amp so that the chroma signal is allowed to pass only when the colour burst signal is contained in the video signal. The colour killer detector stage inputs the following 3 signals and sync-detects the burst signal to detect the presence/absence of the colour burst signal.

(a) Chroma signal:
This signal is supplied from 4.43 MHz bandpass filter CP208 via switch S8.

(b) Burst gate pulse:
This signal is produced in the burst gate pulse generator, as described previously in "burst gate pulse generator", and by this, the colour burst signal is extracted from the chroma signal.

(c) 4.43 MHz reference signal:
This signal is supplied from the 4.43 MHz VCXO, and is used to sync-detect the colour burst signal.

The output of the killer detector stage is charged to C245 connected to pin 12 of IC204, where it is averaged and supplied to the record colour killer. The level at pin 12 is set to Lo (1.7 VDC) when a colour burst signal is present, and to Hi (2.9 VDC) when a colour burst signal is not present.

(9) 1.5 MHz Low Pass Filter

The LPF stage passes only the down-converted chroma signal (627 kHz ±500 kHz) obtained by mixing the chroma signal (4.43 MHz±500 kHz) and the local signal (4.43 MHz + 627 kHz) in the (record) main converter, and eliminates the up-converted 9.49 MHz component. The chroma signal is adjusted to the optimum level by chroma recording level adjustor RT203 and added to the FM-modulated luminance signal in the (recording) Y/C mixer stage to form a composite recording signal.
The recording chroma signal hereafter flows along the same route as the luminance signal.

(10) 5.06 MHz Rotational Signal

The local frequency 5.06 MHz rotational signal which is necessary for chroma frequency down-conversion is generated in IC204. Since the 5.06 MHz signal must be phase-locked to the incoming video signal, two phase comparator stages, AFC and APC, are used. In the recording mode, the 4.43 MHz generation circuitry provides the APC loop to phase-lock the generated 4.43 MHz to the incoming chroma signal, and the 627 kHz(40+1/8 fH) generation circuitry consists of the AFC loop to lock its output frequency to the incoming H. sync signal. First, the 321 fH VCO stage in the 627 kHz generation circuitry produces a 321 fH (5.016 MHz) signal, and then sends it to the 1/8 divider and 4-phase shifter stage to produce a 627 kHz rotational signal. The 4.43 MHz VCXO stage generates 4.43 MHz and this is mixed with the 627 kHz rotational signal inside the 5.06 MHz balanced modulator (sub-converter), producing the desired 5.06 MHz rotational signal.

(11) 5.06 MHz Bandpass Filter

The 5.06 MHz balanced modulator (sub-converter) mixes the 4.43 MHz from the 4.43 MHz generation circuitry and 627 kHz from the 627 kHz generation circuitry. The output of the 5.06 MHz balanced modulator contains sum and difference components. The 5.06 MHz bandpass filter passes the sum component (5.06) MHz to the main converter and rejects the difference component (3.8 MHz).

(12) 627 kHz Generation

In order to remove colour crosstalk leaking from adjacent video tracks, this unit processes the chroma signal in accordance with the chroma phase rotation system specified in the VHS standard.

During recording, the 627 kHz (40.125 fH) generation circuitry generates a precise and stable 626.95312 kHz, 40fH+1/8fH, synchronized with the horizontal sync signal. In addition, to rotate the chroma phase of the recording signal in accordance with the VHS standard, the phase of the chroma recording signal is maintained constant while the CH1 chroma signal is recorded, and is delayed by 90° every 1H while the CH2 chroma signal is recorded.

During playback, the phase of the chroma signal is returned to the original and the crosstalk components are removed by making it pass through a 2H delay line. The 40 fH+1/8 fH generation circuitry is mainly composed of the 321 fH VCO, 1/8, 4 phase shifter, 1/321 dividers and the fH (AFC) phase comparator.

The 1/321 divider divides the 5.016 MHz generated by the 321 fH VCXO down to 15.625 kHz, and sends it to the fH (AFC) phase comparator to form an AFC loop.

The other input to the fH phase comparator is the H. sync pulse derived from the incoming video signal. The fH phase comparator detects the phase difference of two input signal and produces a DC voltage representing the phase difference. Then this DC voltage is fed back to the 321fH VCO.

If the fH signal counted-down from the 321 fH signal does not phase-match the incoming horizontal sync, an error voltage will be generated and applied to the VCO to match both phases.

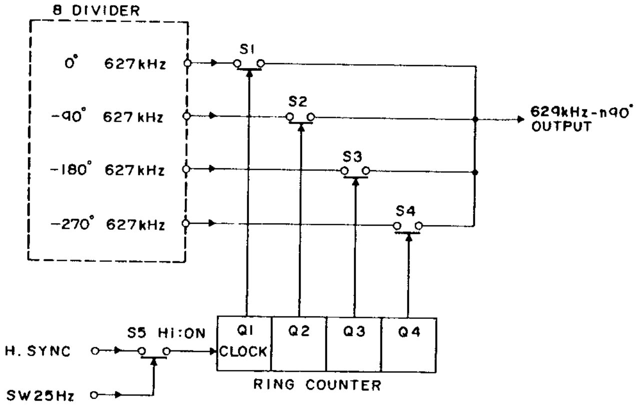
Therefore, the 321fH signal is phase locked to the incoming video signal. The output of 321fH VCO is sent to the 4-phase shifter via 1/8 divider to produce the 627 kHz phase-rotational signal.

(13) 1/8 Divider and 4 Phase-Shifter

The 1/8 divider stage divides the 321 fH (5.016 MHz) by 8 and supplies four 627 kHz pulses with different phases (0°, -90°, -180°, -270°) to the 4-phase shifter. The 4-phase shifter produces a 627 kHz phase rotational signal using the four 627 kHz signals with different phases and 4 switching signals. Fig.3-3 is the equivalent block diagram of the 4-phase shifter. The gates S1-S4 turn on in order to produce the 627 kHz phase rotating signal.

The switching signals are obtained by applying a H. Sync pulse waveshaped by the H. Sync gate stage to a ring counter.

The phase rotation is stopped or enabled by the level of SW25Hz supplied via pin 15. Fig. 3-3 (c)-(f) shows the phases of the switching signals output from the ring counter.



(a) Equivalent Circuit

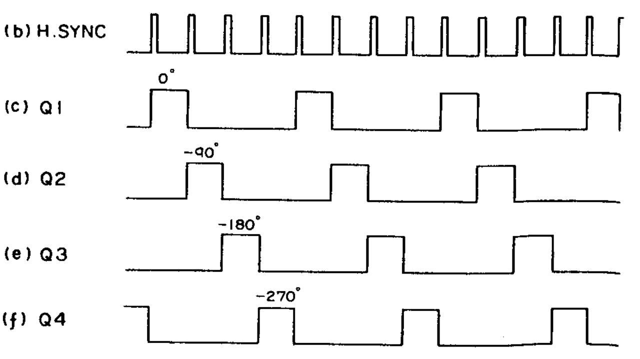


Fig. 3-3 4-Phase Shifter

For the first field when the CH2 video head is in contact with the tape, as the level of SW25Hz is "Hi", switch S5 turns on, the H.sync pulse passes through S5 and enables the ring counter to operate. The ring counter outputs switching pulses shown in (c),(d),(e),(f) and switches S1, S2, S3, S4 pass the 627 kHz with the phases of 0°, -90°, -180°, -270° and 0° again, etc. in order with the period of H. sync.

For the second field when the CH1 video head is in contact with the tape, as the SW25Hz is "Lo" and the clock pulse is stopped from entering the ring counter by S5, the levels of the outputs Q1-Q4 are held as they are. By this, only one specified switch of the 4 switches continues to pass a 627 kHz, with a specified phase.
As a result, when the SW25Hz signal is Lo, the phase of 627 kHz signal is held constant and when the SW25Hz signal is Hi, the phase of 627 kHz signal is delayed by 90° every line (at 64 μs intervals).

(14) 4.43 MHz Generator

During recording, the 4.43 MHz generation circuitry oscillates to produce a precise and stable 4.43 MHz signal synchronized with the incoming burst signal. This output is sent to the 5.06 MHz balanced modulator (sub-converter), 4.43 MHz (APC) phase comparator and the colour killer detector stages.
The 4.43 MHz generation circuitry consists of the 4.43 MHz VCXO and the 4.43 MHz (APC) phase comparator. The 4.43 MHz phase comparator inputs the following 3 signals to phase-lock the 4.43 MHz VCXO oscillation frequency to the colour burst signal frequency.

(a) 4.43 MHz signal:
This signal is supplied from the 4.43 MHz VCO stage and used as the comparison signal.
(b) Chroma signal:

This signal is supplied from the 4.43 MHz bandpass filter stage via switches S1 and S8, and the burst signal contained in this signal is used as the reference signal for phase comparison.

(c) Burst gate pulse
This signal is produced in the burst gate pulse generator and is used to gate only the colour burst signal and to reject the chroma signal present in the scanning period.
The 4.43 MHz phase comparator compares the phase of the 4.43 MHz VCXO output with the burst signal and develops a control volatage proportional to the phase difference between the two signals. The control voltage developed by the phase comparator is fed back to the 4.43 MHz VCXO stage to match the VCXO oscillation phase to that of the burst signal.

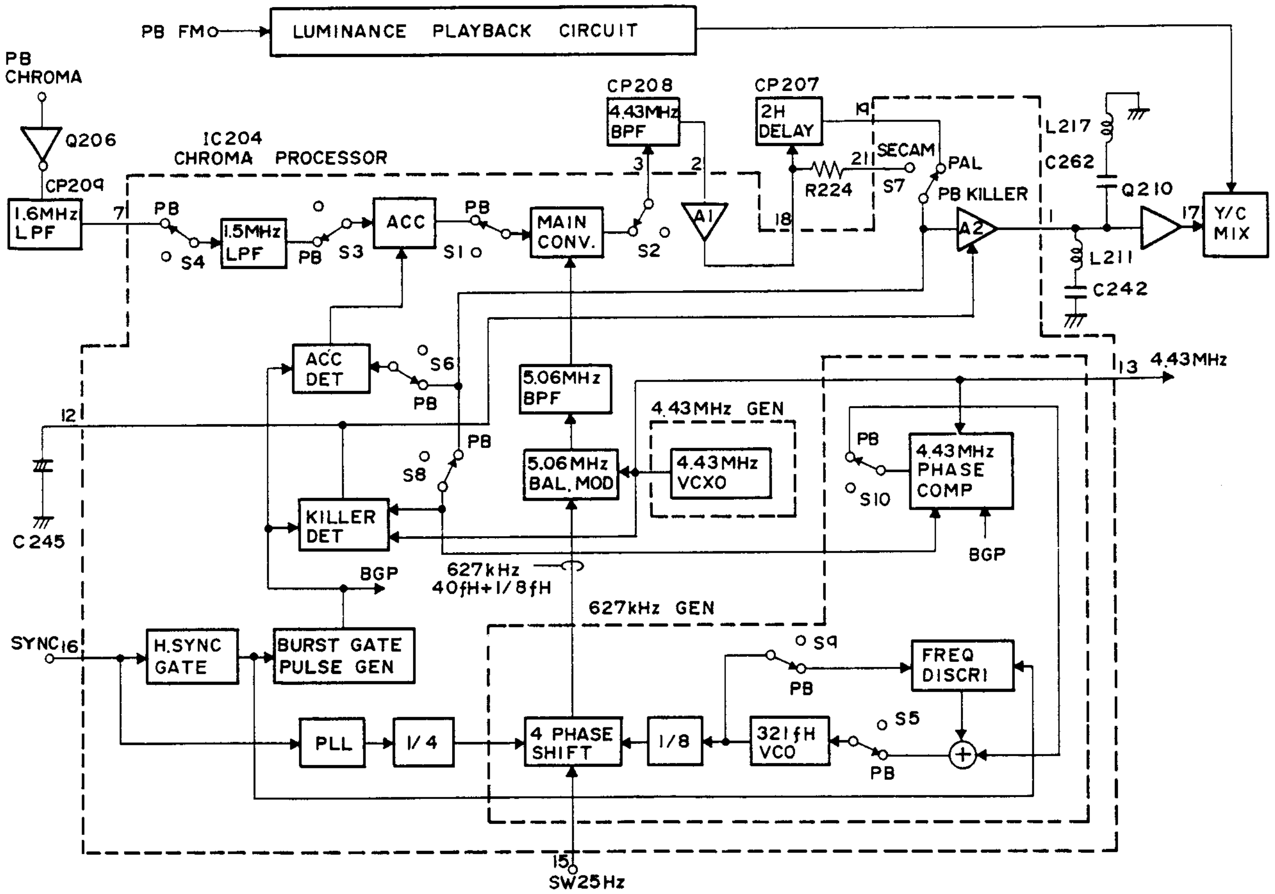

PB FM
LUMINANCE PLAYBACK CIRCUIT
PB CHROMA
Q206
CP209
1.6MHz LPF
IC204
CHROMA PROCESSOR
7
PB
S4
1.5MHz LPF
PB
S3
ACC
PB
S1
MAIN CONV.
CP208
4.43MHz BPF
3
2
S2
A1
CP207
2H DELAY
19
18
211
R224
SECAM
PAL
S7
PB KILLER
A2
L217
C262
Q210
L211
C242
17
Y/C MIX
ACC DET
S6
PB
5.06MHz BPF
12
C245
S8
PB
KILLER DET
5.06MHz BAL. MOD
4.43MHz GEN
4.43MHz VCXO
13
4.43MHz
PB
S10
4.43MHz PHASE COMP
BGP
BGP
627kHz
40fH+1/8fH
627kHz GEN
SYNC 16
H.SYNC GATE
BURST GATE PULSE GEN
S9
PB
FREQ DISCRI
PLL
1/4
4 PHASE SHIFT
1/8
321fH VCO
S5
PB
15
SW25Hz

Fig. 3-4 Chrominance Signal Playback Route

3-2 Chrominance Playback

(1) General

Fig.3-4 shows the main route of the chroma signal in playback.

During playback, the chroma signal is processed in IC204, the same as in recording. The "PB5V" line becomes Hi during play and IC204 pin 20 is set to Hi, so all switches in IC204 are changed over to the "PB" positions to form the chroma playback route. The playback chroma signal is processed as follows.

(2) Playback Chroma Amp

The playback chroma amplifier Q206 receives a 0.2 Vp-p FM signal together with a chroma playback signal at the base, and amplifies it. The amplified chroma signal is applied to pin 7 (0.3 Vp-p) of the chroma processor IC204 via 1.6 MHz lowpass filter CP209.

(3) 1.6 MHz LPF and 1.5 MHz LPF

The 1.6 MHz LPF CP209 and 1.5 MHz LPF contained in IC204 passes only the 627 kHz down-converted chroma signal and blocks the FM luminance component.

(4) ACC

The role and basic operation of the ACC are the same as in the record mode. The output of the ACC stage is sent to the (playback) main converter.

(5) Main Converter

The (playback) main converter stage converts the 627 kHz down-converted playback chroma signal with rotated phase to the original frequency 4.43 MHz and phase. To convert the frequency and phase, this stage mixes the chroma signal (627 kHz ±500 kHz) fed from the ACC stage and the 5.06 MHz local carrier (4.43 MHz + 40fH+1/8fH) which has the same phase rotational characteristic as the playback chroma signal. When these signals are heterodyned, as the phase rotation of the playback signal is cancelled, frequency-converted signal, 4.43 MHz playback chroma signal without phase rotation is obtained at the output.
The output of the (playback) main converter stage is sent to 4.43 MHz bandpass filter via switch S2 and IC204 pin 3 (0.5 Vp-p).

(6) 4.43 MHz Band Pass Filter

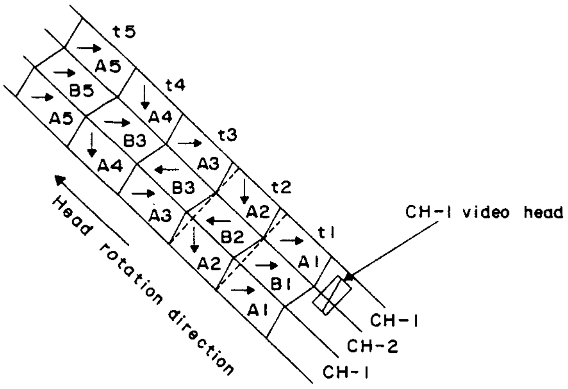
The 4.43 MHz BPF stage (CP301) passes the difference components contained in the (playback) main converter output which is the desired playback chroma signal (4.43 MHz ±500 kHz) and rejects the sum component (5.69 MHz ±500 kHz).

The output of the 4.43 MHz bandpass filter is sent to the 2H delay line (comb filter) via IC204 pin 2, amp A1 and pin 18

(7) 2H Delay Line Filter

In order to greatly reduce the chroma crosstalk which can occur during playback (especially in the LP mode), a 2H delay line filter is used. The 2H delay line filter is composed of a delay path which delays the chroma signal by 2H and a non-delay path.
As is known, the chroma signal phase is altered every 1H but becomes in phase every 2H, and the crosstalk component reverses its phase every 2H due to the function of the chroma phase rotation system. Fig. 3-5 shows the operation of the 2H delay line filter.

When the non-delayed and 2H delayed chroma signals are added in the 2H delay line filter, the chroma components are added in phase, but the non-delayed and 2H delayed crosstalk components are added in reverse phase. As a result, the crosstalk components are cancelled and only the chroma component passes through the 2H delay line filter. The output of the 2H delay line filter is sent to PAL/SECAM changeover switch S7 via pin 19 (0.15 Vp-p).



Phase of Playback Chrominance Signals

	t1	t2	t3	t4
CH-1 track Play	→ A1	↓ A2	→ A3	↓ A4
Crosstrack (CH-2 track)	⇢ B1	⇠ B2	⇠ B3	⇢ B4

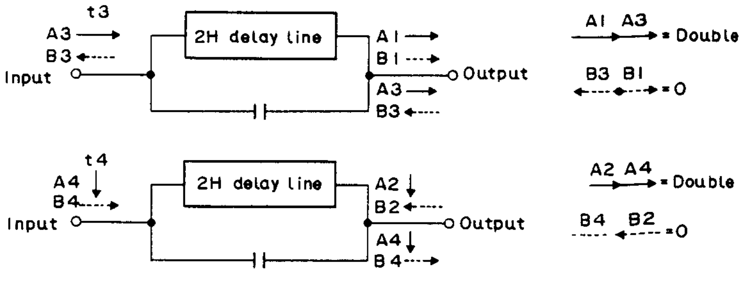


Fig. 3-5 Cancellation of Colour Crosstalk

The SECAM chroma signal is a FM modulated signal and so the crosstalk component can not be cancelled by means of the 2 H delay line. PAL/SECAM switch S7 bypasses the playback chroma signal, when a SECAM chroma signal is played back.

(8) Playback Colour Killer

The role and the basic operation of the colour killer stage are the same as in recording, except the comparison signal is derived from the output of PAL/SECAM switch playback switch S7. The output of the colour killer amp A2 is sent to IC201 pin 17 via IC204 pin 1 and buffer amp Q210, and there it is mixed with the luminance signal. The signal route thereafter is the same as in recording.

Trap stages L211 and C242, L217 and C262 connected to IC204 pin 1 eliminate the 5.5 MHz and 4 MHz components generated by the (playback) main converter to prevent beat interference.

(9) 4.43 MHz VCXO

The 4.43 MHz VCXO generates a precise and fixed 4.43 MHz signal during playback and supplies it to the colour killer detector, 4.43 MHz (APC) phase comparator and 5.06 MHz balanced modulator (sub-converter). In recording, S10, 4.43 MHz phase comparator output switch, is set to the "$\overline{\text{PB}}$ " position, and so a closed loop is formed to lock the 4.43 MHz VCXO frequency to the colour burst signal. However, in playback, the output of S10 is not connected to the 4.43 MHz VCXO, and the 4.43 MHz VCXO operates as a free-running oscillator. The accuracy of the oscillation frequency depends on a crystal integrated in the IC.

(10) 627 KHz Generation circuitry

The role and basic operation of the 627 kHz (40fH+1/8fH) generation circuitry are similar to those in recording, but the 321fH VCO phase control loop differs from that in recording.

(a) 321 fH VCO control loop

The playback chroma signal contains phase fluctuations or jitter due to the fluctuations in the servo system or tape vibrations, etc. This causes deterioration in colour hue.
To remove the phase fluctuations in the (playback) main converter, the 627 kHz generation circuitry applies the same fluctuations to its output as those of the 627 kHz playback chroma signal. To detect the frequency fluctuations, the 4.43 MHz phase comparator phase-compares the burst signal in the playback chroma signal to the 4.43 MHz reference signal supplied from the VCXO, and detects a control voltage proportional to the phase difference of both signals, that is, the frequency fluctuations. As switch S10 is set to the "PB" position during playback, the comparator output is fed to the 321 fH VCO stage. The 321 fH VCO generates a 5.016 MHz signal containing the same frequency fluctuations as those in the burst signal (± ?), and supplies it to the 4-phase shifter via the 1/8 divider. The 4-phase shifter produces the 627 kHz phase rotational signal containing the frequency fluctuations, and supplies it to the (playback) main converter via 5.06 MHz balanced modulator and 5.06 MHz BPF. The (playback) main converter produces sum and difference frequency components of the 5.06 MHz local carrier and 627 kHz playback chroma signal, and the difference component is selected by the 5.06 MHz bandpass filter. The subtraction is performed in terms of phase and frequency, so the phase rotation and frequency fluctuation factors in the playback chroma signal are cancelled. Fig.3-6 shows operation of the main converter involved in cancellation of the chroma signal frequency fluctuations.

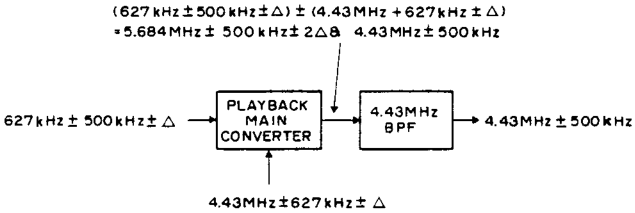

(627 kHz ± 500 kHz ± Δ) ± (4.43 MHz + 627 kHz ± Δ)
= 5.684 MHz ± 500 kHz ± 2Δ & 4.43 MHz ± 500 kHz
627 kHz ± 500 kHz ± Δ
PLAYBACK MAIN CONVERTER
4.43MHz BPF
4.43 MHz ± 500 kHz
4.43 MHz ± 627 kHz ± Δ

Fig. 3-6 Cancellation of Frequency Fluctuations in Playback Chroma Signal

(b) Frequency Discriminator

The oscillation frequency of the 321 fH VCO is controlled not only by the 4.43 MHz phase comparator output but also by the frequency discriminator in the playback mode. The 321 fH VCO has a wide variation range in oscillation frequency. The oscillation frequency may drift greatly from 5.016 MHz during transients such as when power is turned on. In this case, the frequency discriminator operates so that the frequency of the 321fH VCO is set correctly to 5.016 MHz. The frequency discriminator outputs a correction signal, Hi, Lo or open, until it is locked to the correct frequency 321 fH. The oscillation frequency can be found correctly by counting the number of the pulses output in a specified period. When the 321 fH VCO oscillates at 321 fH correctly, the number of pulses output from the VCO for 1H period is exactly 321. For example, when it oscillates at 325 fH, the number of the pulses is 325, increasing by 4. Actually, the frequency discriminator divides the VCO frequency by 3 and then counts the number of pulses for 6 H to detect the frequency deviation in greater detail. For that purpose, when the reading is 639 (nominal: 321 x 1/3 x 6 = 642) or less due to a lower osicllation frequency, the frequency discriminator outputs Hi to the 321 fH VCO to increase the oscillation frequency. When the number of the pulses counted in the 6 H period is 644 or more, the discriminator outputs Lo to lower the frequency, and when the oscillation frequency is within 321fH +1fH, the discriminator turns off its output to suspend control.

(11) 5.06 MHz Balanced Modulator (Sub-converter)

5.06 MHz balanced modulator stage mixes the 4.43 MHz (fsc) supplied from the 4.43 MHz VCXO and 627 kHz (40fH +1/8fH) supplied from the 627 kHz generation circuitry and then creates the 5.06 MHz (4.43 MHz + 627 kHz) local carrier signal, and supplies it to the 5.06 MHz BPF stage.

(12) 5.06 MHz Band Pass Filter

The 5.06 MHz BPF stage selects and passes the mixed 5.06 MHz (4.43 MHz + 627 kHz) signal and then supplies this output to the (playback) main converter.

(13) SECAM Mode Discriminator

The SECAM mode discriminator is provided in the models CT, VPS, SW, DS, GK, DH and etc.
Automatic discrimination of the SECAM mode is done by the SECAM discriminator IC205 on the Y/chroma P.C.B.
Fig. 3-7 shows the SECAM mode discriminator circuit. The discriminator outputs "Hi" at pin 9 for the SECAM mode and "Lo" for the PAL mode. The burst flag pulse produced in IC204 is supplied to the chroma amp/limiter via pin 4 of IC205 to extract the burst signal from the chroma signal. The frequency of the burst signal is a constant 4.43 MHz when the input signal is PAL chroma signal, and is 4.4 MHz and 4.25 MHz alternating every 1H for the SECAM chroma signal.
When the burst signal passes through the 4.5 MHz bandpass filter X1 in the next stage, the output amplitude is constant for the PAL chroma signal, but for the SECAM chroma signal, it alternates every 1H and the amplitude of 4.25 MHz is lower than that of 4.4 MHz.

The burst signal passed through 4.5 MHz crystal X1 is fed to the rectifier and the envelope of the rectifier output is almost constant for the PAL chroma signal, but contains 768.25 Hz (1/2 fH) ripple for the SECAM chroma signal. The rectifier output is amplified by the 768.25 Hz tuning amp consisting of amp A2, L1 and C2, and the burst signal and 15.625 kHz components are removed and only the 796.25 Hz ripple component is derived at pin 8 .
The 768 Hz ripple component is compared to a reference voltage by comparator COMP1, and the section higher than the reference voltage is output to lowpass filter LPF.
The output of COMP1 is smoothed by the LPF to become a DC voltage. Comparator 2 compares the DC voltage output from LPF and the reference voltage and then outputs "Lo" to pin 9 when a PAL chroma signal is input and "Hi" when a SECAM chroma signal is input.
The output of the SECAM mode discriminator is sent to IC204 pin 17, QR1301, etc.

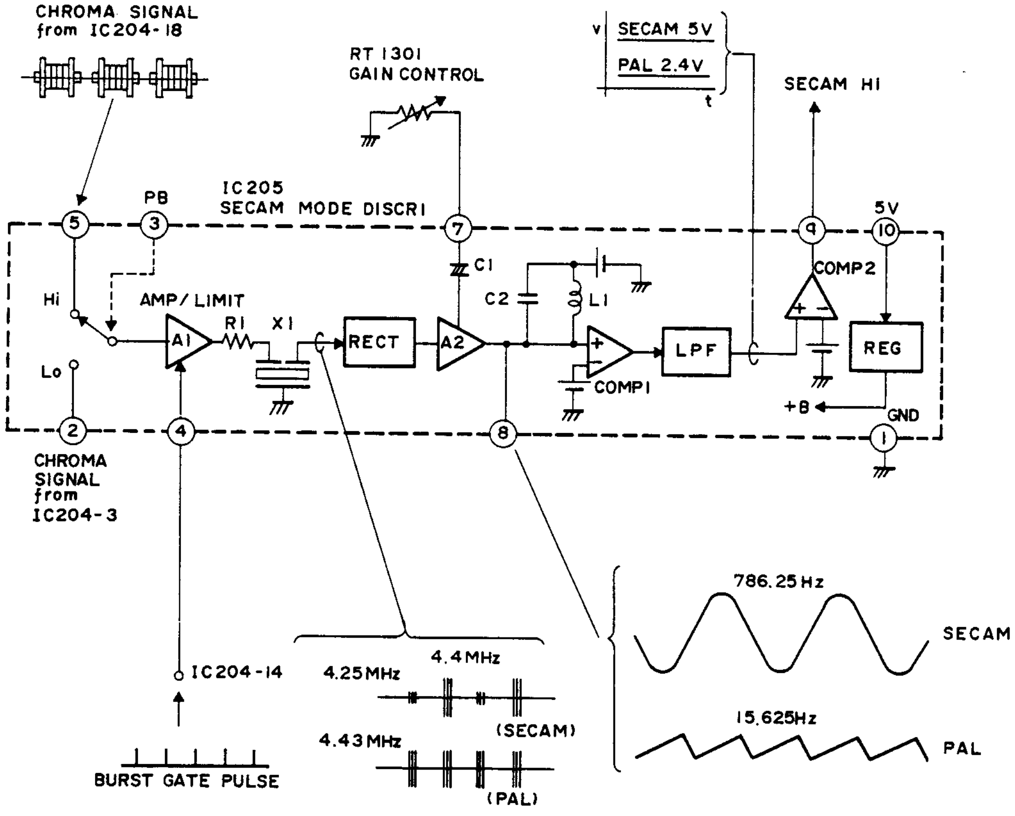


Fig. 3-7 SECAM Mode Discriminator

CHAPTER 4 AUDIO CIRCUIT

4-1 Outline of Audio Circuit

Fig.4-1 is a simplified audio block diagram.

Input selector IC2503 selects the audio signal supplied from the tuner/IF block (1 Vp-p) or AUDIO IN pins of the EURO jack, and feeds the selected audio signal (1 Vp-p) to audio recording/playback amplifier IC401. Select switch S1 in IC2503 is changed over by the voltage at pin 1. When the system control µP receives commands to perform simulcast recording or to select the line-in audio signal, as pin 43 or 44 of IC901 goes "Hi" and this "Hi" is applied to QR2501 via an OR gate, QR2501 turns on to set IC2503 pin 1 to "Lo", and IC2503 selects the audio input signal supplied from the EURO jack. In the initial state when the power is turned on, as the system control µP sets the above mentioned pins to "Lo", the input select switch selects the tuner audio.

In the record mode, IC401 amplifies the recording signal input via pin 25 and applies frequency compensation to it, then outputs it to the audio head via pin 20. In the playback mode, IC401 receives a playback audio signal picked up by the audio head via pin 15 and applies frequency compensation to it in the preamplifier stage, and after amplification, outputs it to the RF converter and EURO jack via pin 30.

4-2 Audio Recording Circuit

Fig. 4-2 shows the route of the audio recording signal. Record/playback amplifier IC401 receives a 50 mVp-p recording audio signal which has been divided by R407 and R405. Muting switch S11 mutes the signal when pin 12 is "Hi" which is supplied from MAIN MUTE pin 59 of system control µP IC901. The logic level of MAIN MUTE is normally "Lo" in the record mode. The output of muting switch S11 is sent to the ALC stage. The ALC stage regulates its output so that it does not exceed a specified level to prevent distortion. Switch S7 in the next stage is controlled by the voltage at pin 10 supplied from the system control µP pin 4 PLAY, and selects the ALC output in the record mode. Line amplifier A1 amplifies the output of S7 and outputs it to the record amplifier, RF converter and EURO jack via muting switch S12 and pin 30 (2.2 Vp-p). Muting switch S12 turns off when the power supply line is turned on or off, and eliminates pop sound. The ALC detector accepts the audio output via the divider consisting of R408 and R409 to detect the average audio output level, and rectifies it.

The rectified DC voltage is smoothed by the filter circuit connected to pin 27, and an ALC control voltage is developed at pin 27. The gain of the ALC stage is inversely proportional to the ALC control voltage at pin 27. When the average input audio signal is over a specified level (2.5 Vp-p at the EURO jack), the signal input via pin 25 is regulated by the ALC control voltage so that the audio output level is limited within the specified level (2.8 Vp-p at the EURO jack).

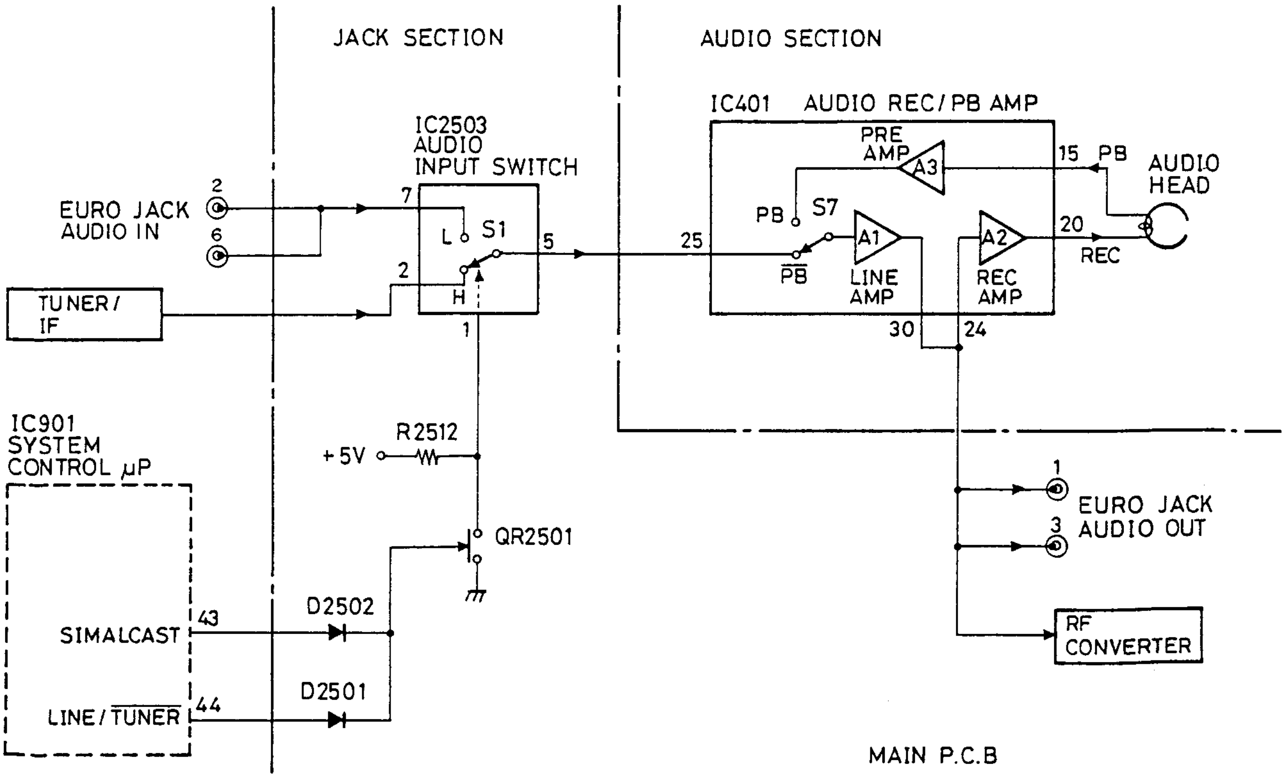

JACK SECTION
AUDIO SECTION
IC401 AUDIO REC/PB AMP
PRE AMP
A3
15 PB
AUDIO HEAD
IC2503 AUDIO INPUT SWITCH
EURO JACK AUDIO IN
2
6
7
L
S1
5
25
PB
S7
A1
A2
20
REC
$\overline{\text{PB}}$
LINE AMP
REC AMP
2
H
TUNER/IF
1
30
24
IC901 SYSTEM CONTROL µP
R2512
+5V
QR2501
1
EURO JACK AUDIO OUT
3
D2502
43
SIMALCAST
D2501
44
LINE/$\overline{\text{TUNER}}$
RF CONVERTER
MAIN P.C.B

Fig. 4-1 Simplified Audio Block Diagram

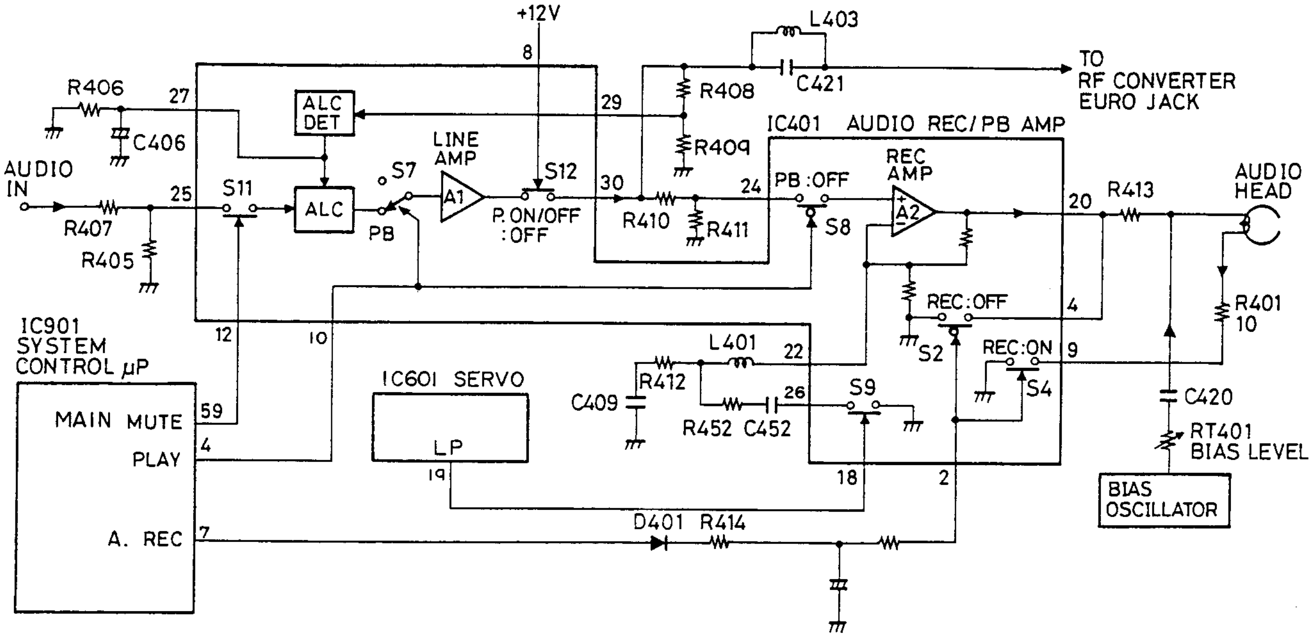

+12V
8
L403
TO
RF CONVERTER
EURO JACK
R406
27
ALC DET
29
R408
C421
IC401 AUDIO REC/PB AMP
C406
R409
LINE AMP
REC AMP
AUDIO IN
S7
S12
30
24
PB :OFF
R413
AUDIO HEAD
25
S11
ALC
A1
A2
20
R407
PB
P.ON/OFF :OFF
R410
R411
S8
R405
REC:OFF
4
R401 10
IC901 SYSTEM CONTROL µP
12
10
L401
22
S2
REC:ON
9
IC601 SERVO
R412
26
S9
S4
C409
C420
MAIN MUTE
59
R452 C452
RT401 BIAS LEVEL
PLAY
LP
19
18
2
BIAS OSCILLATOR
A. REC
7
D401 R414

Fig. 4-2 Audio Recording Signal Route

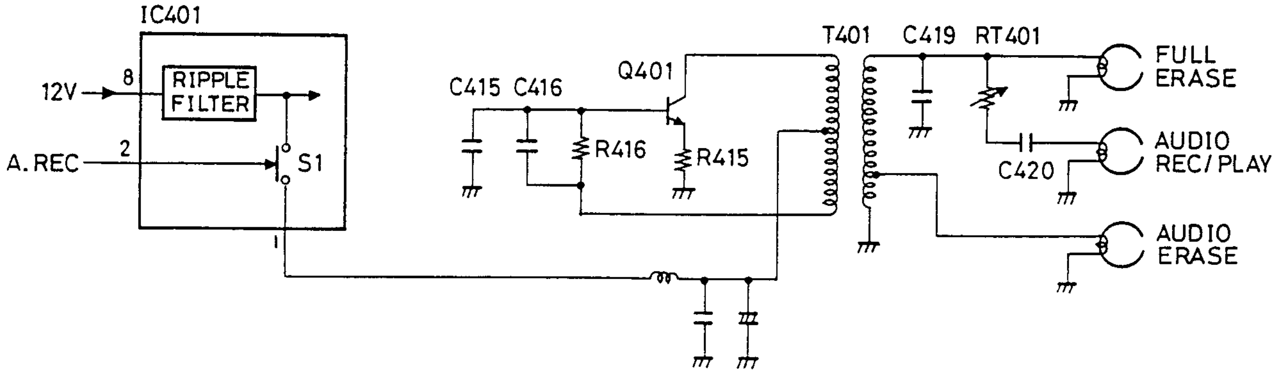

IC401
T401
C419
RT401
FULL ERASE
12V
8
RIPPLE FILTER
C415 C416
Q401
R416
R415
A.REC
2
S1
AUDIO REC/PLAY
C420
AUDIO ERASE
1

Fig. 4-3 Bias Oscillator

The audio signal amplified by the line amp is applied to the record amplifier via the divider consisting of R410 and R411, switch S8 which blocks the recording signal in the playback mode. The record amplifier A2 boosts the high frequency components of the recording signal so that the signal to be played back has the frequency response specified in the VHS standard. The high frequency components around 13 kHz are boosted by approximately 14dB by the serial resonence circuit L401 and C409 (connected to pin 22) in the SP mode. However, when the tape speed is LP, as S9 is closed with logic "Hi" applied to pin 18 from the servo IC, the high frequency components around 7 kHz are boosted by 18dB by the equalizer circuit consising of L401, C409 and C452.

In the record mode, as switch S2 turns off and switch S4 is turned on by the logic "Hi" at pin 2 supplied from the system control µP, the recording current flows through pin 20 (1.5 Vp-p), R413, audio head, R401, pin 9, S4 and to ground.

Audio bias level adjustor RT401 sets the audio bias current to 210 µA-260 µA to make the playback frequency response wider and minimize distortion. During loading, phase matching, and record pause, the system control µP sets A.REC pin 7 to "Lo", causing S4 in the IC to turn off and recording to be inhibited.

4-3 Bias Oscillator

Fig. 4-3 shows the bias oscillator circuit. The bias oscillator circuit is composed of a Hartley oscillator and generates a sine wave of approximately 70 kHz. The oscillator output is supplied to the full erase (120 Vp-p), audio record/playback (40 Vp-p) and audio erase (55 Vp-p) heads.

Activation of the bias osillator circuit is controlled by the power supply circuit incorporated in IC401. In the recording mode, as logic "Hi" A.REC is supplied to switch S1, S1 turns on and supplies power to the bias oscillator to activate the oscillator.

4-4 Playback Head Loss Equalizer

The playback high frequency response of audio heads is attenuated because of high frequency loss caused by magnetic coating thickness loss, spacing loss and gap loss, etc. To compensate for the attenuation of the playback signal in the high frequency band a playback head loss equalizer is provided before the preamplifier.

C401 and C480 compensate the playback head loss. C401 and C480 form a serial resonance circuit with the head inductance and boosts the high frequency components around 12 kHz by 3dB in the SP mode. In the LP mode, as S3 turns on and C451 is connected in parallel to C401 and C480, the playback head loss equalizer boosts the high frequency components around 6 kHz approximately by 3dB.
The low level playback signal frequency-compensated in the high frequency band is applied to preamplifier via pin 15 (0.7 mV).

4-5 Preamplifier

Fig. 4-4 shows the audio playback circuit. The playback frequency response of the audio head increases with a gradient of 6dB/oct. in the low and medium frequency bands. To make the total playback frequency response from the head to the preamplifier output flat, the play-back equalizer circuit enhances the low and mid band frequency components at the gradient of -6dB/oct.
The enhancement of low and mid band frequency components is achieved by the negative feedback network provided between pins 21 and 17 of IC401.
The preamplifier output is sent to muting switch S13 via pin 21 (0.2 Vp-p), audio playback level adjustor RT402 and pin 23 (50 mVp-p) of IC401. In the still, slow and search play modes, or during loading, MAIN MUTE pin 59 of the system control μP outputs logic "Hi" to IC401 pin 12. By this, the muting switch S13 turns off to mute audio. The signal route hereafter is the same as in recording. The line amplifier A1 outputs the playback signal to the EURO jack and RF converter via pin 30 (2.2 Vp-p). L403 and C421 form a 70 kHz trap and block the bias signal to leak to the output pins. The RF converter accepts a 0.8 Vp-p audio signal via a divider consisting of R2530 and R2531.

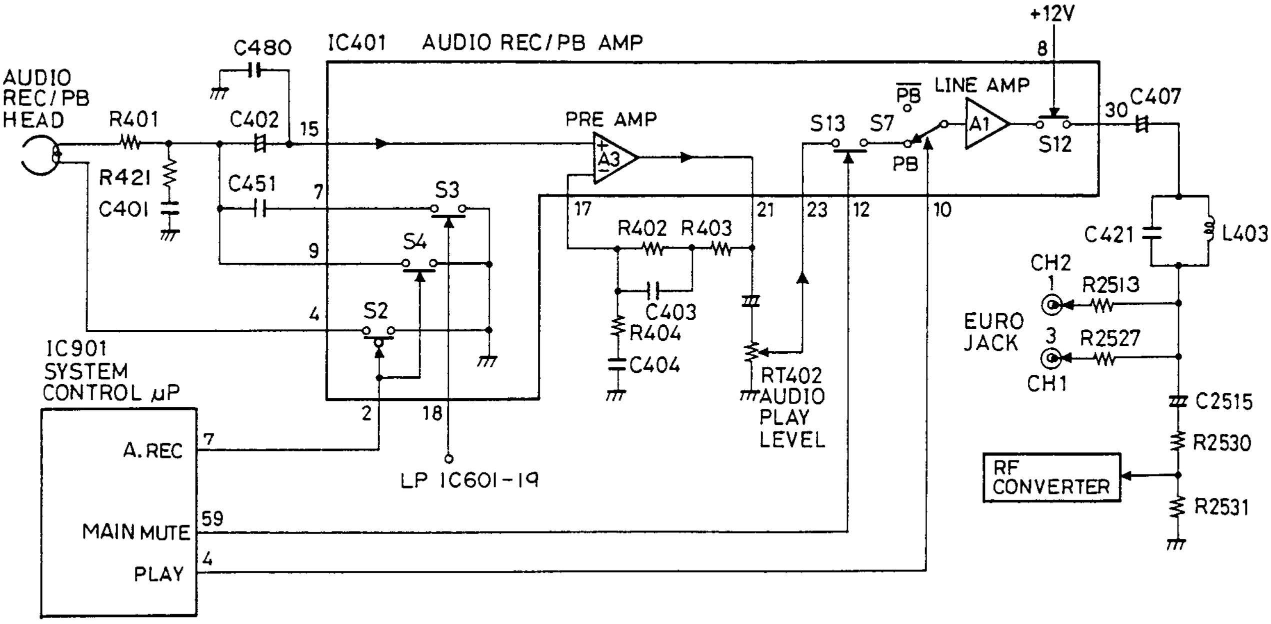

AUDIO REC/PB HEAD
R401
R421
C401
C480
C402
C451
IC401 AUDIO REC/PB AMP
15
7
9
4
2
18
S3
S4
S2
PRE AMP
A3
17
R402 R403
C403
R404
C404
21
23
12
10
RT402 AUDIO PLAY LEVEL
S13 S7
PB
PB
LINE AMP
A1
S12
+12V
8
30
C407
C421
L403
CH2
1
R2513
EURO JACK
3
R2527
CH1
C2515
R2530
RF CONVERTER
R2531
LP IC601-19
IC901 SYSTEM CONTROL μP
A.REC
7
MAIN MUTE
59
PLAY
4

Fig. 4-4 Audio Playback Signal Route

CHAPTER 5 SYSTEM CONTROL CIRCUIT

5-1 Overview

Fig. 5-1 shows a simplified block diagram of the system control and related circuits.
The system control circuit has a system control µP at its center and carries out the following functions.

1) The system control µP receives operation commands from the timer µP via a communication bus and implements the commands. The timer accepts the operation commands via local function switches or the IR remote control receiver. DATA(T-S) and CLOCK(S-T) pins 36 and 38 are involved in this operation.

2) The system control µP transmits information on modes of operation to the timer µP to control the operation of the timer µP and to display the mode of operation in the display tube. DATA(S-T), CLOCK(S-T) and COUNT DATA pins 37-39 are involved in transmitting the information to the timer µP.

3) The µp drives the cassette loading mechanism via the capstan motor driver and capstan motor to load and eject cassettes while monitoring the state of the cassette loading mechanism. CAPST BRAKE, CAPST MODE, CAPST 1, CAPST 2 and CST UP/DOWN pins 28, 29, 64, 63, 54 are involved in these operations. The µP

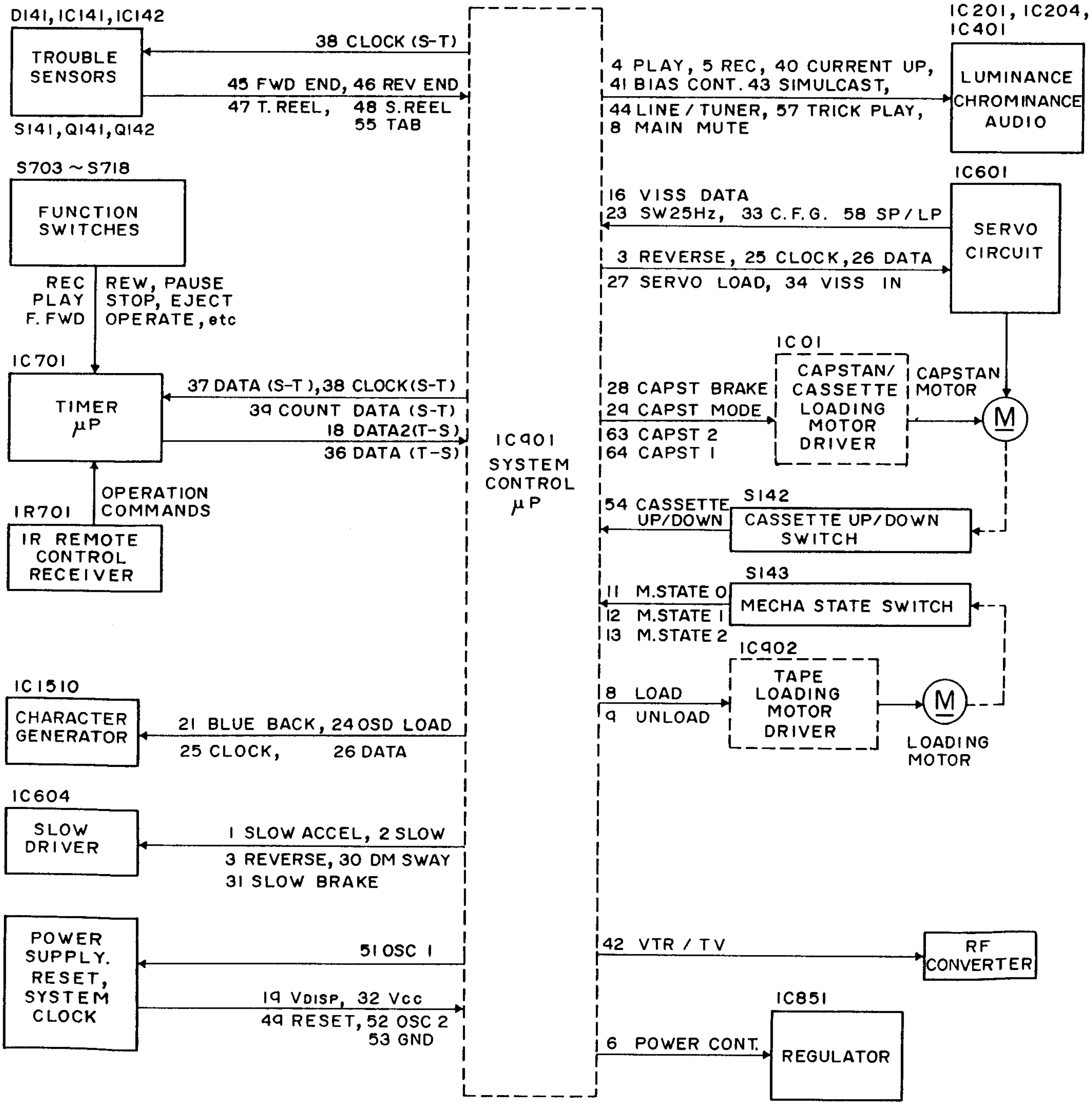

D141, IC141, IC142
TROUBLE SENSORS
S141, Q141, Q142
38 CLOCK (S-T)
45 FWD END, 46 REV END
47 T. REEL, 48 S.REEL
55 TAB
S703 ~ S718
FUNCTION SWITCHES
REC
PLAY
F. FWD
REW, PAUSE
STOP, EJECT
OPERATE, etc
IC701
TIMER µP
37 DATA (S-T), 38 CLOCK(S-T)
39 COUNT DATA (S-T)
18 DATA2(T-S)
36 DATA (T-S)
IR701
OPERATION COMMANDS
IR REMOTE CONTROL RECEIVER
IC1510
CHARACTER GENERATOR
21 BLUE BACK, 24 OSD LOAD
25 CLOCK, 26 DATA
IC604
SLOW DRIVER
1 SLOW ACCEL, 2 SLOW
3 REVERSE, 30 DM SWAY
31 SLOW BRAKE
POWER SUPPLY. RESET, SYSTEM CLOCK
51 OSC 1
19 VDISP, 32 Vcc
49 RESET, 52 OSC 2
53 GND
IC901
SYSTEM CONTROL µP
IC201, IC204, IC401
4 PLAY, 5 REC, 40 CURRENT UP,
41 BIAS CONT. 43 SIMULCAST,
44 LINE / TUNER, 57 TRICK PLAY,
8 MAIN MUTE
LUMINANCE CHROMINANCE AUDIO
IC601
16 VISS DATA
23 SW25Hz, 33 C.F.G. 58 SP/LP
3 REVERSE, 25 CLOCK, 26 DATA
27 SERVO LOAD, 34 VISS IN
SERVO CIRCUIT
IC01
CAPSTAN/ CASSETTE LOADING MOTOR DRIVER
CAPSTAN MOTOR
M
28 CAPST BRAKE
29 CAPST MODE
63 CAPST 2
64 CAPST 1
54 CASSETTE UP/DOWN
S142
CASSETTE UP/DOWN SWITCH
S143
11 M.STATE 0
12 M.STATE 1
13 M.STATE 2
MECHA STATE SWITCH
IC902
8 LOAD
9 UNLOAD
TAPE LOADING MOTOR DRIVER
M
LOADING MOTOR
42 VTR / TV
RF CONVERTER
IC851
6 POWER CONT.
REGULATOR

Fig. 5-1 Block Diagram of System Control

drives the tape loading mechanism via the tape loading motor driver and loading motor while monitoring the state of the tape loading mechanism. LOAD and UNLOAD pins 8 and 9; MECH STATE 0-2 pins 11-13 are involved in this operation.

4) The μp swithes the mode of opration and functions in the Y/chroma and audio circuits. PLAY, REC and A. REC and A.DUB pins 4, 5, 7 and 10; CURRENT UP, BIAS CONT.,VTR/TV, SIMULCAST, LINE/TUNER, TRICK PLAY and MAIN MUTE pins 40-44, 57 and 59 are involved in these operations.

5) The μP outputs digital commands via CLOCK(S-SRV), DATA(S-SRV) and SERVO LOAD pins 25-27 to switch the mode of opration of the servo circuit. It also monitors the state of the servo circuit via CAPST.FG, SW25Hz and SP/$\overline{\text{LP}}$ pins 33, 23 and 58.

6) The μp monitors the outputs of trouble sensors to prevent damage to the tape and mechanism in the case of a mulfunction. Pins 38 CLOCK(S-T), 47 REEL LOCK, 46 REV END, 45 FWD END, 55 TAB are involved in this operation.

7) The μP calculates the remaining time of tape by counting the period of the take-up and supply reel pulses at pins 47 and 48. The remaining time is sent to the timer μP via COUNT. DATA pin 39 to display the time in the display tube.

8) The μP controls VHS index search system (VISS). To make the servo circuit record an index signal at the start of each programme that is recorded, the μP outputs VISS DATA via pin 16. When an index signal is detected and so a logic "Hi" is input at VISS IN pin 34 in the fast forward or rewind mode, the μP carries out scanner play (forward search).

9) The μP sends characters to the character generator to display them on the TV screen. BLUE BACK, OSD LOAD, CLOCK and DATA pins 21, 24, 25 and 26 is responsible for OSD (On-Screen-Display). VT-M620E series models are not provided with the OSD function.

10) In the slow mode, the tape is driven intermittently. SLOW ACCEL, SLOW, REVERSE, DM SWAY, SLOW BRAKE at pins 1, 2, 3, 30, 31 are used to drive the tape intermittently. The slow function is not provided in VT-M620E series models.

5-2 Activation of System Control μP

Fig 5-2 shows the circuit related to the activation of the system control μP.
When the μP is powered, a system clock signal is generated and suppied to the internal digital processing circuits, so that the microprocessor is activated. After the activation of the microprocessor, a reset pulse is generated and applied to the microprocessor to initiallize the system control programme. Thus the system control μP can control the entire VTR system.

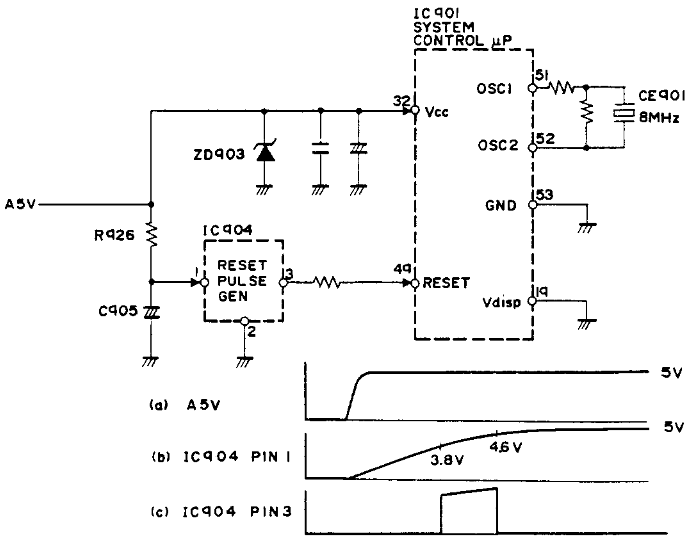


Fig. 5-2 Activation of System Control μP

The system control μP is powered by the A5V power source which is always present regardless of the operation of the operate switch. This enables the system control μP to accept commands from the function keys and to start timer recording in the operate off mode.
The system clock generator provided between pins 51 and 52 oscillates at 8 MHz and applies it to the internal digital processing circuit.
Reset pulse generator IC904 inputs the A5V power supply via an RC time constant circuit consisting of R926 and C905. When the A5V power supply is first supplied to the VTR, the reset pulse generator accepts the signal increasing as shown Fig. 5-2 (b) and generates a reset pulse as shown in (c). When the reset pulse is applied to reset input pin 49 of the system control μP, the system control μp is initialized and the VTR is set forcibly to the stop mode.

5-3 Microprocessor Communications

Fig. 5-3 shows the communication lines among the system control μP, timer μP, servo IC and character generator. (The character generator is not used in VT-M620E series models).
Fig. 5-4 is a timing diagram of data transfer between the system control μP and the timer μP. Table 5-1 and 5-2 show communication codes transferred between the system control μP and the timer μP. The timer μP informs mainly the system control μP operation commands input via function switches provided on the front panel or remote control hand unit. The system control μP mainly informs the timer μP the mode of operation to display it on the display tube. Table 5-3 shows counter data transferred from the system control μP to the timer μP.

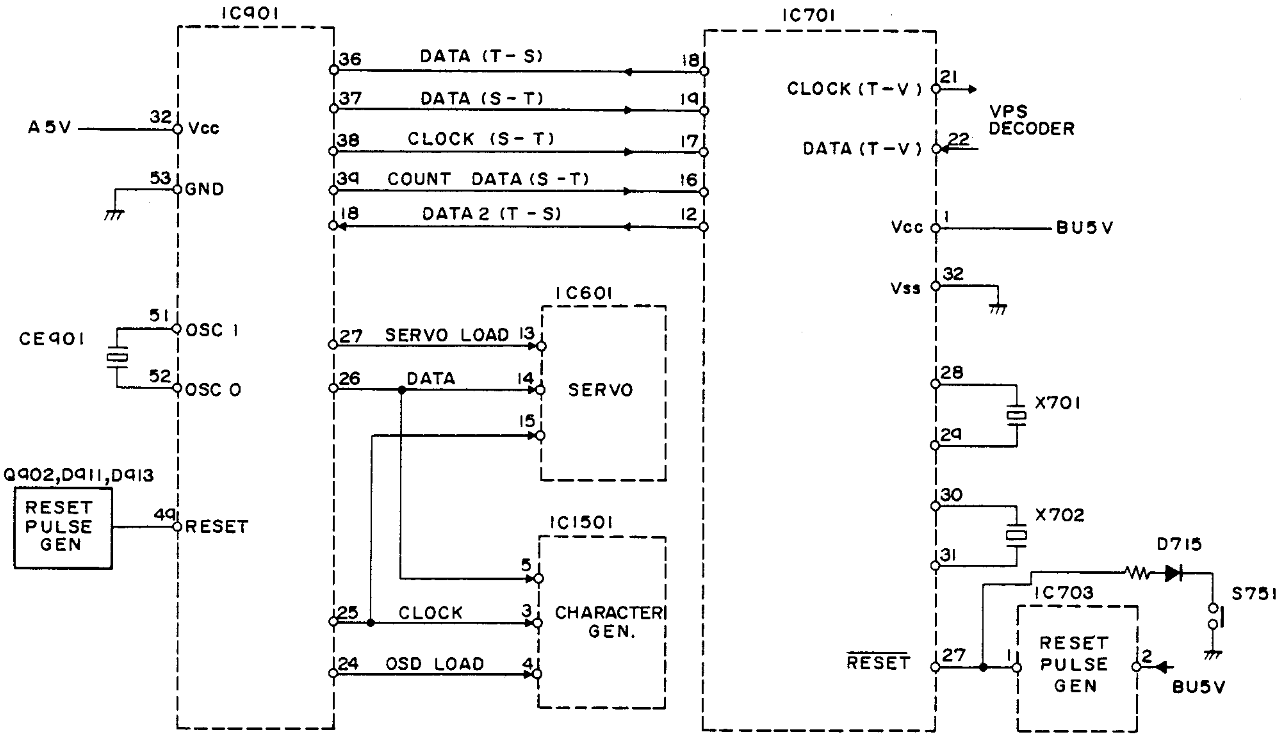

IC901
A5V
32 Vcc
53 GND
CE901
51 OSC I
52 OSC O
Q902,D911,D913
RESET PULSE GEN
49 RESET
36 DATA (T-S) 18
37 DATA (S-T) 19
38 CLOCK (S-T) 17
39 COUNT DATA (S-T) 16
18 DATA 2 (T-S) 12
IC601
27 SERVO LOAD 13
26 DATA 14
15
SERVO
IC1501
5
25 CLOCK 3
CHARACTER GEN.
24 OSD LOAD 4
IC701
CLOCK (T-V) 21
DATA (T-V) 22
VPS DECODER
Vcc 1
BU5V
Vss 32
28
29
X701
30
31
X702
D715
S751
IC703
RESET 27
1
RESET PULSE GEN
2
BU5V

Fig. 5-3 Communication Lines

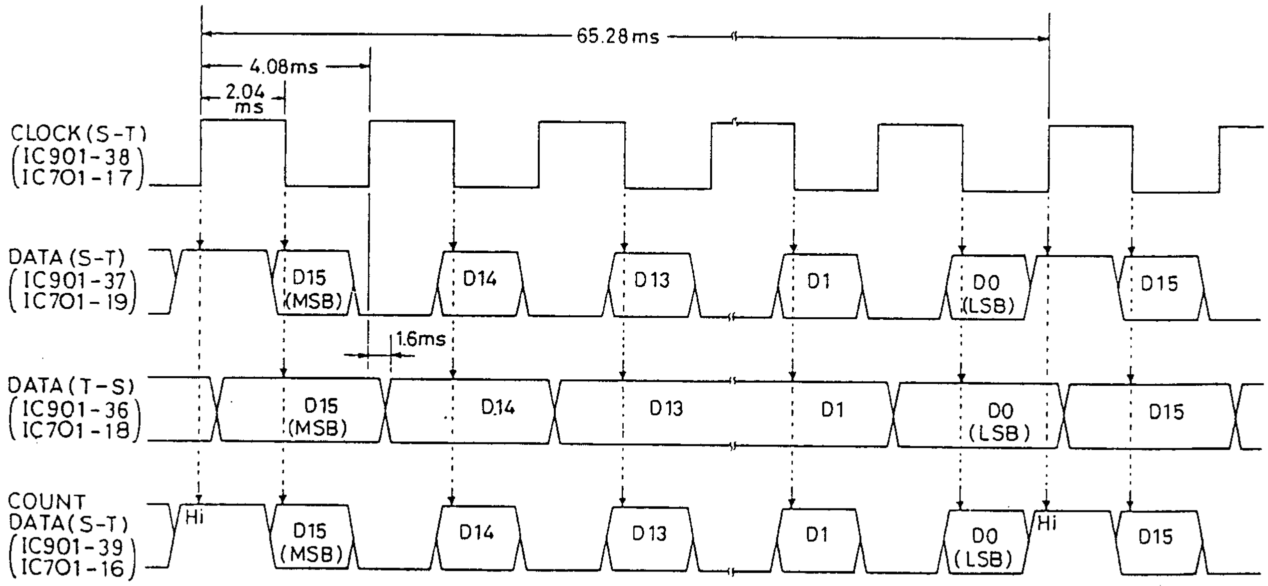

65.28ms
4.08ms
2.04 ms
CLOCK (S-T) (IC901-38 IC701-17)
DATA (S-T) (IC901-37 IC701-19)
D15 (MSB)
D14
D13
D1
D0 (LSB)
D15
1.6ms
DATA (T-S) (IC901-36 IC701-18)
D15 (MSB)
D14
D13
D1
D0 (LSB)
D15
COUNT DATA (S-T) (IC901-39 IC701-16)
Hi
D15 (MSB)
D14
D13
D1
D0 (LSB)
Hi
D15

Fig. 5-4 Data Communication Timing

The system control µP and timer µP are connected via 5 data communication lines, DATA (S-T), DATA (I-S), COUNT DATA (S-T), DATA2(T-S) and CLOCK (S-T).

DATA(S-T), COUNT DATA(S-T) and CLOCK (S-T) are the data and control lines through which the system control µP transmits data to the timer µP. DATA(T-S) and DATA2(T-S) transmits data from the timer µP to the system control µP. The transfer of data on the DATA(S-T), DATA(T-S), DATA2(S-T) and COUNT DATA(S-T) lines is synchronized with the clock signal on the CLOCK(S-T) line.

The information transferred are composed of 16-bit serial binary data represented by "Hi" and "Lo", and the transmission of data from the system control µP to the timer µP is initiated by a start bit.

The system control µP set "Hi" to the data output port (pins 37 and 39) at the leading edge of the clock pulse to designate the start bit. The timer µP finds the start bit by looking for "Hi" input on the data line at the leading edge of the clock signal.

Following the start bit, the first bit of data is output on the data line. At the trailing edge of the clock signal, the timer µP reads the single binary data

("Hi" or "Lo"). After the first bit of the 16-bit serial data has been read by the timer μP, the system control μP pulls the data line to "Lo." until the leading edge of the next clock pulse is output. After transmiting the leading edge of the clock pulse, the system control μP places the second bit of the 16-bit serial data on the data line, and the timer μP reads the second bit on the data line at the trailing edge of the clock pulse. This sequence is repeated 16 times for the transmision of 16-bit serial data (D0 through D15).

The transmission of data from the timer μP to the system control μP is also done synchronized with the clock signal applied from the system control μP. After the system control μP has set the start bit at the leading edge of the clock pulse, the timer μP places the data on the data line (pin 18 or 12). At the trailing edge of the clock signal, the system control μP reads the data on the data line (pin 18 or 36). This sequence is repeated until 16 bits of binary data are transmitted.

Table 2-1 Communication Code for Data(T-S)

D2 D1 D0	0	1	2	3	4	5	6	7
D5 D4 D3	0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
0 0 0 0	P. FAILURE			DISPLAY			DIGIT 9	DIGIT 8
1 0 0 1	DIGIT 7	DIGIT 6	DIGIT 5	DIGIT 4	DIGIT 3	DIGIT 2	DIGIT 1	DIGIT 0
2 0 1 0		AUTO PLAY			TIMER INDEX	P. TOGGLE	DVE TOGGLE	
3 0 1 1								F. ADV
4 1 0 0	STOP	KEY OFF	REW	F.FWD	PIX IN PIX	MULTI STROBE	PAUSE TGL	DVE CANCEL
5 1 0 1	REC	CNT/RMN TGL	PLAY	P IN P POSITION		MEMORY TGL		SLOW
6 1 1 0	REV. SRCH	FWD SRCH	EJECT	FREEZE TGL	SLOW T. UP	SLOW T. DN	E240/ E180	MENU
7 1 1 1	REPEAT	CNTR RESET	SLOW S.DN	INDEX	V.DUB	A.DUB	SLOW S. UP	NO OP

D7 D6	- 0	- 1	0 -	1 -
CONTENTS	INDEX OFF	INDEX ON	TIME REC OFF	TIME REC ON

P: POWER
DVE: DIGITAL VIDEO EFFECTS
TGL: TOGGLE
CNTR/RMN: COUNTER/REMAIN
SLOW T.: SLOW TRACKING
SLOW S.: SLOW SPEED

D9 D8	- 0	- 1
CONTENTS	MULTI. INDEX AUTO OFF	MULTI. INDEX AUTO ON

D11 D10	0 0	0 1	1 0	1 1
CONTENTS	-	SP	LP	EP

D13 D12	- 0	- 1	0 -	1 -
CONTENTS	TV	VTR	MUTE OFF	MUTE ON

D15 D14	- 0	- 1	0 -	1 -
CONTENTS	SIMUL OFF	SIMUL ON	TUNER INPUT	LINE INPUT

Table 2-2 Communication Code for Data(S-T)

D2 D1 D0		0	1	2	3	4	5	6	7
D5 D4 D3		0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
0	0 0 0			POWER OFF REW			TIMER REC		
1	0 0 1								
2	0 1 0	STOP	F.FWD	REW			REC	V.DUB	PLAY
3	0 1 1	FWD SRCH	REV SRCH	SLOW		A.DUB	FAST	REVERSE	POWER OFF
4	1 0 0	STOP-PAUSE			REC-PAUSE	V.DUB-PAUSE			STILL
5	1 0 1				FRAME ADV.	A.DUB PAUSE			
6	1 1 0	STOP-DEW							
7	1 1 1								POWER OFF DEW

State of Tape

D7 D6	0 0	0 1	1 0	1 1
CONTENTS	TAPE RUN	TAPE BACK	TAPE END	NO TAPE

Tab and Transient

D9 D8	0 -	1 -	- 0	- 1
CONTENTS	TAB OFF	TAB ON	TRANSIENT OFF	TRANSIENT ON

Tape Speed

D11 D10	0 0	0 1	1 0	1 1
CONTENTS	-	SP	LP	EP

Digital Video and OSD

D14 D13 D12	0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
CONTENTS	* DVE OFF	TV FREEZE	RESERVE REVIEW	OSD MODE	PIX IN PIX	P IN P REV.	MULTI P IN P	TITLE

DVE: DIGITAL VIDEO EFFECTS

State of Memory Stop

D5	0	1
CONTENTS	MEMORY OFF	MEMORY ON

Table 2-3 Counter Data(S-T)

Bits	Counter data	Remaining time	Index number
D3 D2 D1 D0	Represent 1's digit counter reading	Represent 1's minute	Represent 1's digit index number
D7 D6 D5 D4	10's digit counter reading	10's minute	Represent 10's digit index number
D11 D10 D9 D8	100's digit counter reading	1's hour	D9 D8: 0 1 = SCANNER D9 D8: 1 0 = INDEX OFF
D15 D14 D13 D12	1000's digit counter reading	1 0 1 0: T-180 tape 1 0 1 1: T-240 tape	1 1 0 0

Receiving commands from operating switches and sensors, the system control µP controls the servo IC
Data controlling the servo IC are transferred serially using CLOCK, DATA and SERVO LOAD pins 25, 26 and 27. Fig. 5-5 shows the waveforms transmitted from the system control µP to the servo IC.
The system control µP sends the character code to the character generator to display characters on the TV screen.
CLOCK and DATA pins 25 and 26 are used in common to the servo IC and character generator and the SERVO LOAD and $\overline{\text{OSD LOAD}}$ are used to specify the destination of the data, the servo IC or character generator.
Data transmitted to ICs are as follows.

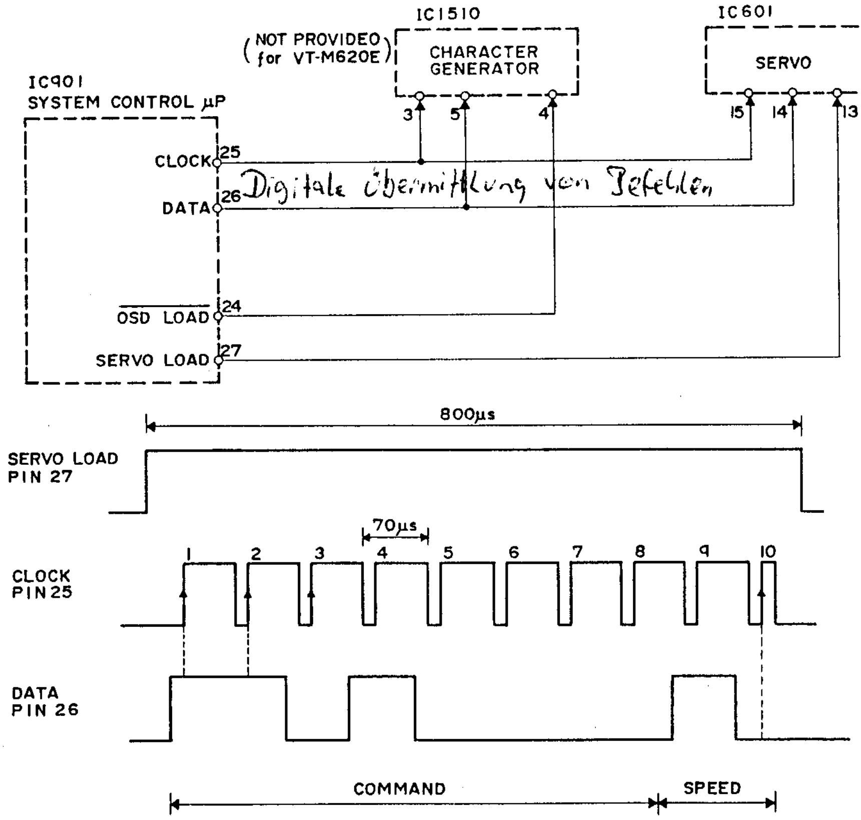
IC1501:character generator (Not provided in VT-M620E series models)
character code, position where characters are displayed.

IC601: servo IC
Mode switching data: record, playback, slow, pause, reverse, stop, search, F.FWD, etc.

5-4 Cassette Loading/Ejecting

Fig 5-6 shows the cassette/tape loading control circuit.
The loading motor is responsible for loading the tape, and the capstan motor is responsible for loading the cassette.

The capstan motor's power is transmitted to the cassette loading mechanism when a cassette is loaded or ejected and to the tape transport mechanism when a cassette has been loaded. The switching of the motive power transmission to the cassette loading or tape transport mechanism is performed mechanically by the F.L. change gear.



IC1510
IC601
(NOT PROVIDED for VT-M620E)
CHARACTER GENERATOR
SERVO
IC901
SYSTEM CONTROL µP
3
5
4
15
14
13
CLOCK
25
26
Digitale Übermittlung von Befehlen
DATA
24
OSD LOAD
27
SERVO LOAD
800µs
SERVO LOAD PIN 27
70µs
1 2 3 4 5 6 7 8 9 10
CLOCK PIN25
DATA PIN 26
COMMAND
SPEED

Fig. 5-5 Data Transfer to Servo IC

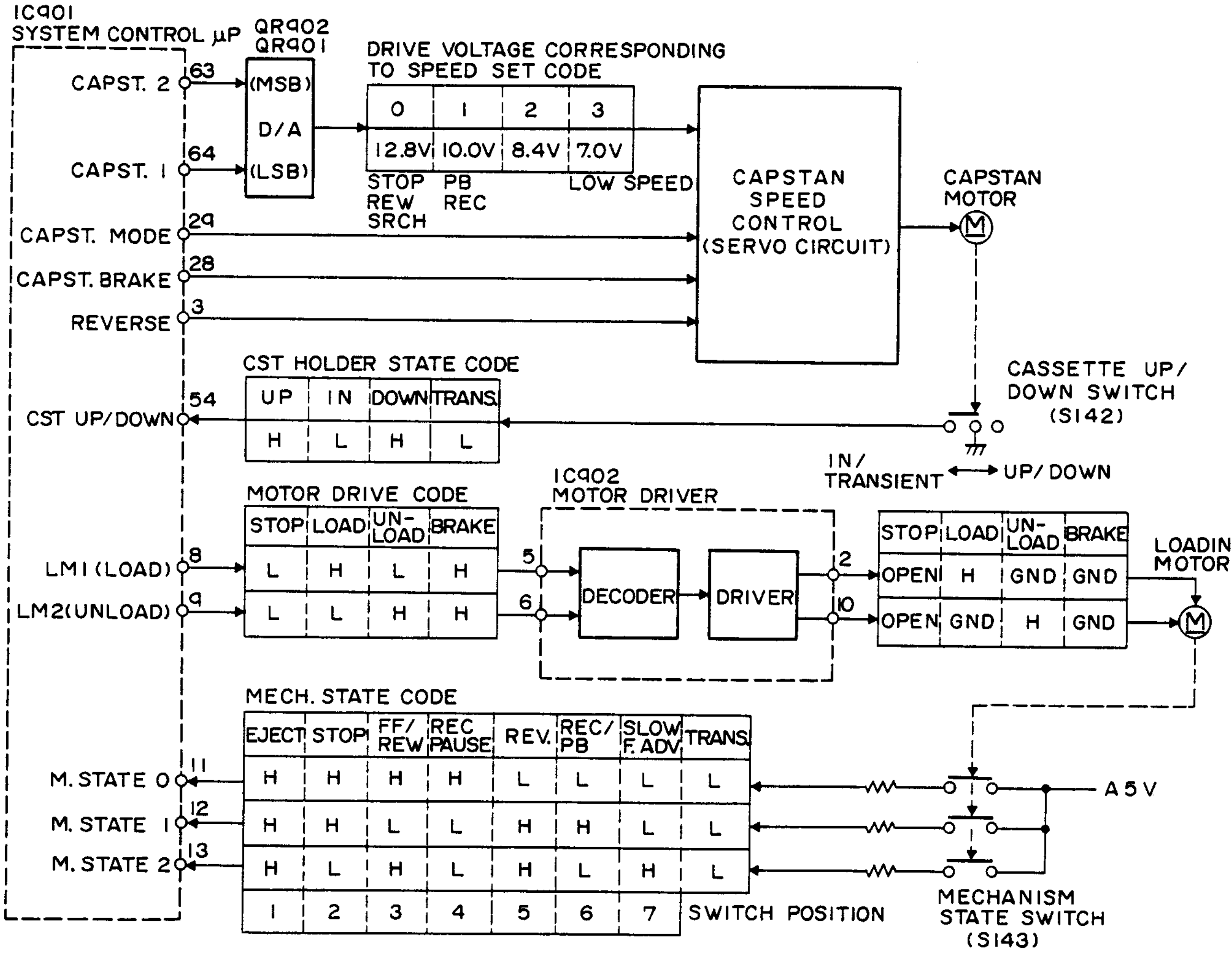

IC901
SYSTEM CONTROL µP
QR902
QR901
CAPST. 2
63
(MSB)
D/A
CAPST. 1
64
(LSB)
CAPST. MODE
29
CAPST. BRAKE
28
REVERSE
3
DRIVE VOLTAGE CORRESPONDING TO SPEED SET CODE
0
1
2
3
12.8V
10.0V
8.4V
7.0V
STOP REW SRCH
PB REC
LOW SPEED
CAPSTAN SPEED CONTROL (SERVO CIRCUIT)
CAPSTAN MOTOR
M
CST HOLDER STATE CODE
UP
IN
DOWN
TRANS.
H
L
H
L
CST UP/DOWN
54
CASSETTE UP/ DOWN SWITCH (S142)
IN/ TRANSIENT
UP/DOWN
IC902 MOTOR DRIVER
MOTOR DRIVE CODE
STOP
LOAD
UN-LOAD
BRAKE
LM1 (LOAD)
8
L
H
L
H
LM2(UNLOAD)
9
L
L
H
H
5
6
DECODER
DRIVER
2
10
STOP
LOAD
UN-LOAD
BRAKE
OPEN
H
GND
GND
OPEN
GND
H
GND
LOADING MOTOR
M
MECH. STATE CODE
EJECT
STOP
FF/ REW
REC PAUSE
REV.
REC/ PB
SLOW F.ADV
TRANS.
M. STATE 0
11
H H H H L L L L
M. STATE 1
12
H H L L H H L L
M. STATE 2
13
H L H L H L H L
1 2 3 4 5 6 7
SWITCH POSITION
A5V
MECHANISM STATE SWITCH (S143)

Fig. 5-6 Tape/Cassette Loading Control Circuit

During cassette loading/ejecting, the capstan motor is controlled by the motor control signals (CAPST. BRAKE, CAPST. MODE, CAPST. 1 and CAPST. 2) coming from pins 28, 29, 64 and 63 of the system control µP. The direction of rotation of the capstan motor, normal or reverse, is determined by the REVERSE signal output from pin 3.

Fig. 5-7 shows the timing of cassette loading/eject.
The position where the cassette holder is located is detected by cassette up/down switch S142 and the detected data is applied to pin 54 of the system control µP. When there is no cassette in the unit, the mechanism is in the "eject" position, and "Hi" is applied to pin 54 of the system control µP by cassette up/down switch S142. When the operator inserts a cassette into the VTR firmly, as cassette up/down switch S142 is pressed mechanically and grounds pin 54, pin 54 changes from "Hi" to "Lo" and commands system control µP to load the cassette. During loading, pin 54 is maintained at "Lo", and as CAPST. MODE pin 29 is set to "Hi", the capstan motor is driven by the drive voltage determined by the logic levels at pins 63 and 64.

Just before the cassette holder reaches the desired "down" position, pin 54 changes from "Lo" to "Hi", causing REVERSE pin 3 and CAPST BRAKE pin 28 to go "Hi" and then CAPST. MODE pin 29 to go "Lo". By this, braking is applied to the capstan motor which is then stopped, to complete cassette loading.
On the other hand, after the cassette holder has reached the down position, pin 8 LOAD and 9 UNLOAD output "Hi, Lo": "Hi, Hi" and "Lo, Lo", so that the tape loading mechanism is set to the "stop" position.
Doing this, the F.L change gear that transmits the capstan motor motive power to the cassette loading mechanism is separated from the cassette loading mechanism.

When the system control µP receives an eject command, it sets REVERSE pin 3 to "Hi" and rotates the capstan motor in reverse at a speed determined by the servo IC to remove slack tape for 0.2 seconds before unloading starts: After slack removal, the system control µP sets pins 28 and 29 "Hi" to apply braking and to stop the capstan motor. 0.2 seconds after the eject command, the system control µP sets UNLOAD pin 9 to "Hi" to set the mechanism to the "eject"

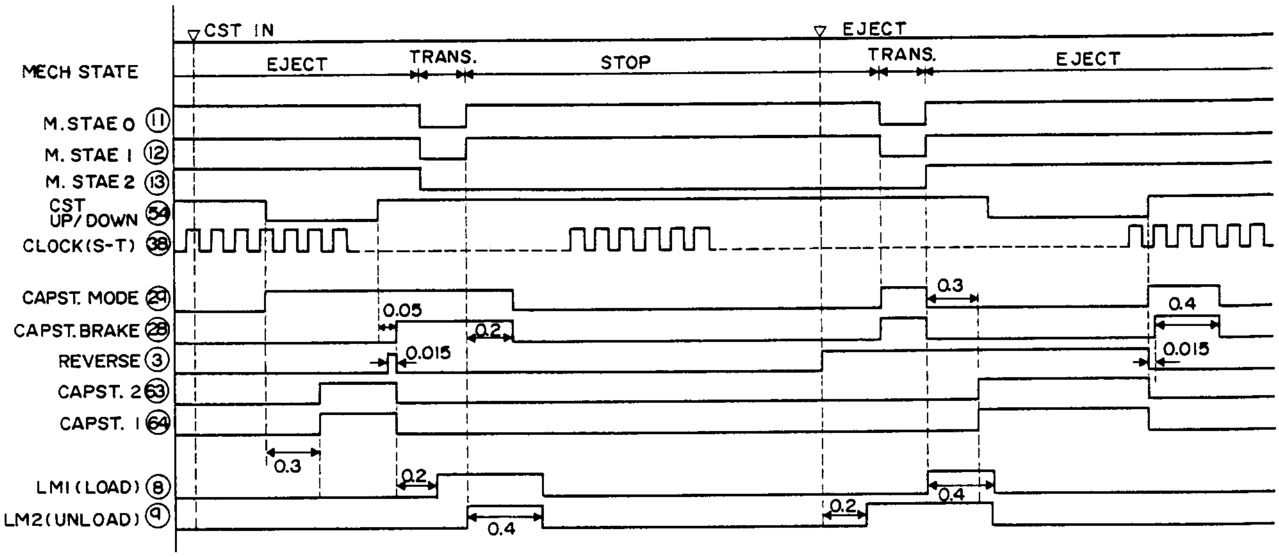

CST IN
EJECT
MECH STATE
EJECT
TRANS.
STOP
TRANS.
EJECT
M.STAE 0 ⑪
M. STAE 1 ⑫
M. STAE 2 ⑬
CST UP/DOWN (54)
CLOCK(S-T) (38)
CAPST. MODE (29)
CAPST. BRAKE (28)
REVERSE ③
CAPST. 2 (63)
CAPST. 1 (64)
LM1(LOAD) ⑧
LM2(UNLOAD) ⑨
0.05
0.2
0.015
0.3
0.2
0.4
0.3
0.4
0.015
0.2
0.4

Fig. 5-7 Timing of Cassette Loading/Ejecting

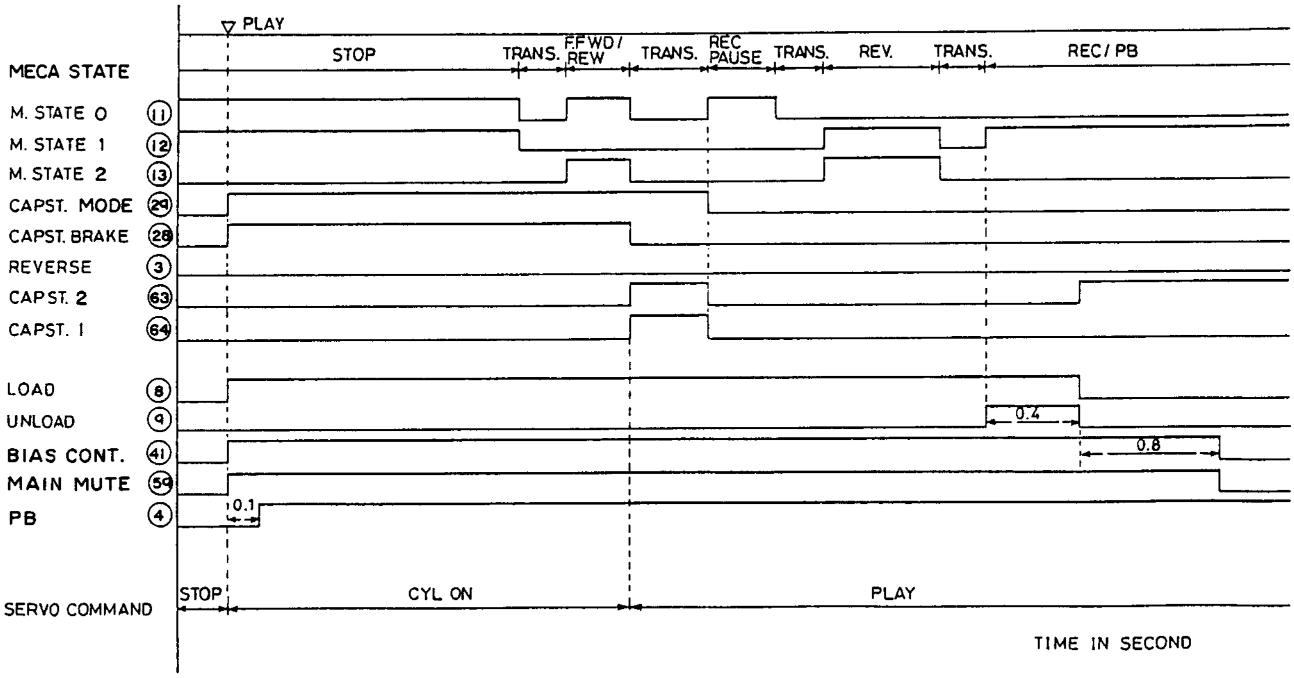

PLAY
MECA STATE
STOP
TRANS.
F.FWD/ REW
TRANS.
REC PAUSE
TRANS.
REV.
TRANS.
REC/PB
M. STATE 0 ⑪
M. STATE 1 ⑫
M. STATE 2 ⑬
CAPST. MODE (29)
CAPST. BRAKE (28)
REVERSE ③
CAPST. 2 (63)
CAPST. 1 (64)
LOAD ⑧
UNLOAD ⑨
BIAS CONT. (41)
MAIN MUTE (59)
PB ④
0.1
0.4
0.8
SERVO COMMAND
STOP
CYL ON
PLAY
TIME IN SECOND

Fig. 5-8 Timing of Tape Loading

position and to transmit the capstan motor motive power to the cassette loading mechanism via the F.L.change gear.
Thus, the cassette holder starts to move in the direction of unloading. During eject, the capstan motor driver is supplied with a low supply voltage (7.2V) determined by CAPST 1 and 2, and the drive current is determined by CAPST. MODE at the initial stage and then by the servo circuit to drive the mechanism with the optimum motive power. As the cassette holder proceeds in the direction of eject, receiving information on the cassette unloading process from cassette up/down switch S142, the level of CST UP/DOWN pin 54 changes from "Hi" to "Lo" and then to "Hi". When the cassette is ejected, the level of pin 54 changes from "Lo" to "Hi". At this time, the μP applies a brake to the capstan motor and then stops the capstan motor to complete ejecting.

5-5 Tape Loading/Unloading

Fig. 5-8 shows the timing of tape loading.
Afer a cassette been loaded to the stop position, the capstan motor's power is transmitted to the tape transport mechanism to allow the tape loading motor to drive the tape loading operation.
When either the record or play button is pressed, the system control μP outputs

"Hi" at pin 8 and "Lo" at pin 9 as shown in the chart to load the tape. Receiving these voltages at pins 5 and 6, the tape loading motor driver IC902 outputs "Hi" at pin 2 and "Lo" or ground at pin 10 and applies them to the (tape) loading motor. By this, tape loading begins. Mechanism state switch S143 is a seven-position rotary switch, and detects a 3-bit digital code representing the eject, stop, fast forward/rewind, pause, reverse, record/playback or slow(frame advance) position. The mechanism state code is supplied to the system control µP at pins 11, 12 and 13. The system control µP knows from the 3-bit digital code that the mechanism has been set to the desired position. When "Lo", "Hi" and "Lo" are applied to pins 11, 12 and 13, the µP judges the playback/record mechanism have been formed and outputs "Hi" and "Hi" via pins 8 and 9 for braking the loading motor and then stops the loading operation. At the same time when the tape loading operation is completed, CAPST. 1 is set to "Hi" to reduce the power supply voltage and power comsumption of the capstan motoer driver, and 0.8 seconds after, BIAS CONT. and MAIN MUTE pins 41 and 59 are set to "Lo" to permit audio and video signals to be monitored. This is basically the same for unloading.

5-6 Trouble Protection

Fig. 5-9 shows the trouble protection circuit.
The system control µP monitors the cassette up/down switch, mechanism state switch, safety tab switch, forward/rewind end sensors, take-up reel sensor, supply end sensor and etc. to prevent damage to the tape and mechanism.

Safety tab switch S141

This switch detects whether or not the erasure prevention tab of the cassette is present. If the tab has been removed, "Hi" level is applied to pin 55. In this case, the system control µP inhibits recording. If the timer standby mode is selected at this time, the system control µP ejects the tape.

Mechanism state switch and cassette up/down switch S142

If a desired state code is not returned within a certain time (2 seconds for cassette loading and 5 seconds for tape loading) after transmitting a cassette loading/unloading or tape loading/unloading command, the system control µP regards the mechanism as malfunctioning and reverses the motor rotation to return the mechanism to the initial state.
If the mechanism does not return to the initial state by the reverse rotation of the motor, it executes the initial command once again. And if the desired state code is not still obtained, power will be turned off.

Take-up reel sensor IC141

This detects the rotation of the take-up reel disk. 16 magnetic poles arranged in a ring are provided on the back of the take-up reel disk, and the reel sensor detects 8 pulses (REEL PULSE) as the reel disk makes a single rotation.
The system control µP receives the pulse signals at pin 29 and, if the frequency of the signal is below a specified value (1/6 Hz in the record/play and search modes, 1/3 Hz in the fast-forward and

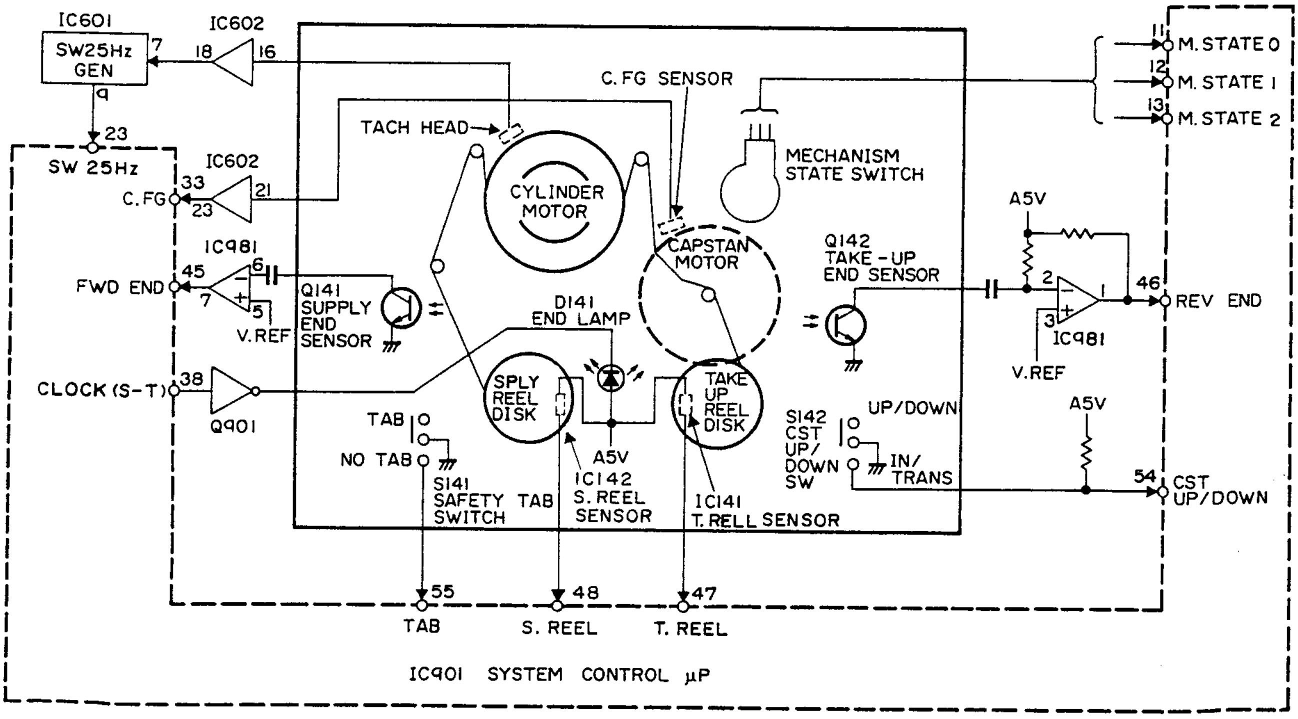

IC601
SW25Hz GEN
7
9
IC602
18
16
23
SW 25Hz
IC602
33
21
C.FG
23
IC981
6
45
7
5
FWD END
V.REF
CLOCK (S-T)
38
Q901
C.FG SENSOR
TACH HEAD
CYLINDER MOTOR
CAPSTAN MOTOR
Q141 SUPPLY END SENSOR
D141 END LAMP
SPLY REEL DISK
TAKE UP REEL DISK
TAB
NO TAB
S141 SAFETY TAB SWITCH
A5V
IC142 S.REEL SENSOR
IC141 T.RELL SENSOR
MECHANISM STATE SWITCH
Q142 TAKE-UP END SENSOR
S142 CST UP/DOWN SW
UP/DOWN
IN/TRANS
A5V
2
3
1
IC981
V.REF
A5V
11
M.STATE 0
12
M.STATE 1
13
M.STATE 2
46
REV END
54
CST UP/DOWN
55
TAB
48
S. REEL
47
T. REEL
IC901 SYSTEM CONTROL µP

Fig. 5-9 Trouble Protection Circuit

rewind modes), it regards the reel disk as stationary and sets the mechanism to the stop mode.

Supply reel sensor IC142
The structure of the supply reel sensor is the same as that of take-up reel sensor and the signal produced is the same as in the take-up reel sensor.
The supply reel pulses detected are used to calculate the remaining time of tape together with the take-up reel sensor.

End lamp D141
The end lamp is installed close to the middle of the mechanism and is driven by the clock signal (with 4-ms period) output from CLOCK(S-T) pin 38 of the system control µP and emits a infrared pulse to the supply and take-up end sensors.

End sensors Q141, Q142
There are two end sensors (Q141 on the supply side, Q142 on the take-up side). These are infrared-sensitive phototransistors that conduct when light from the end lamp strikes them.
The supply end sensor which detects the trailer tape at the supply end is connected to pin 45 and the take-up end sensor which detects the leader tape at the rewind end is connected to pin 46, via IC901.
The end sensors turn off when the cassette is in position and the coated part of the tape blocks the passage of the infrared rays.
When the outputs of the sensors are higher in level than the reference voltage at pins 3 and 5 of IC901, "Lo" level is applied to the system control µP.
When the leader/trailer tapes at the ends of tape pass light, the end sensor receives the light and turns on.
When the system control µP counts two infrared pulses, it judges that the tape has reached the end and performs the following control.

o If the pulse is coming to pin 45 (FWD END), the system control µP judges that the tape is at the end in forward travel and starts rewinding the tape.
o If the pulse is coming to pin 46 (REV. END), the system control µP judges that the tape is at the end in reverse travel and sets the system to the stop mode.
  After this, the system control µP advances the tape untill the leader pasts the take-up end sensor.

The end sensors also detect whether or not a cassette is present at the completion of cassette loading. If the system control µP detects the presence of both end sensors' outputs at the same time, it judges that no cassette has been loaded, and unloads the cassette holder to the eject position.

Detection of cylinder lock
The servo circuit generates the SW25Hz signal from the TACH pulse detected by the tach head. The system control µP receives the SW25Hz signal at pin 23 and counts its frequency.
If the cylinder motor slows down or is locked for any reason, the frequency of the SW25Hz signal falls. If the frequency falls below 10 Hz, the system control µP judges that the cylinder motor is defective, unloads the mechanism to protect the tape and turns off power.

Detection of slack tape
The system control µP receives the C. FG pulse at pin 33 via the servo circuit and detects whether it is present or not during unloading.
If no C. FG pulse can be detected during unloading, the system control µP judges that the capstan motor is idle and not working to remove slack tape, stops the unloading operation, and turns off power.

5-7 Edit Control

When pause is instructed during recording and new audio/video signals are to be recorded on the previously recorded audio/video tracks, the edit (phase match, assemble) control system controls recording to minimizes noise occurring when this section is played back.
Noise appears due to the following reasons.

(1) An non-recorded section could be produced between the end of the previously recorded section and the start of the newly recorded section.
(2) The previously recorded video track pattern and newly recorded track pattern ?are discrepant.
(3) The cylinder speed and tape speed are slightly different at the joint of new and old recordings.
(4) Since the low frequency components recorded are hard to erase, the previously recorded chroma signal is not erased sufficiently and prodeces rainbow noise.

To prevent this, when pause is applied, the tape is rewound by an appropriate amount for backspacing and the following controls are performed.

(1) To prevent a non-recorded section from being produced at the joint of the old and new recorded sections, a minimum of one video track is recorded while being overlapped.
(2) To prevent variations in the tape speed at the joint, the tape speed of the new recording is controlled to the correct tape speed (SP or LP) before the new recording starts.
(3) To prevent any discrepancy in the track patterns, the tracking control system makes the video heads trace the prerecorded track pattern and the cylinder servo system makes the rotation of video heads lock to the frame frequency of the video signal to be recorded before the new recording starts.
(4) To prevent rainbow noise caused by incomplete erasing at the overlapped recorded section, the recording current is increased by about 20% ranging 16.6 cm after recording is restarted.

The system control µP is responsible for (1) and (4) and the servo circuit for (2) and (3). See the cylinder/capstan phase processing for the detailed description of these controls.

Fig. 5-10 is a timing diagram of edit control. There are three important points in this operation.

The first is that, after pause and backspacing are instructed, the pressure roller continues to be pressed against the capstan until pause is released. (However, when recording pause continues for more than 5 minutes, the pressure roller is released from the capstan to prevent damaging the roller. Releasing the presure roller from the capstan is acomplished by changing the mechanism state to "REC PAUSE" from "SLOW".)

The second is that in the reverse period, the capstan speed is set to double the normal speed by the system control µP and the capstan motor is driven by the servo circuit. In the reverse period, the system control µP rewinds the tape for approximately 2.4 seconds and counts the number of C.FG pulses to measure the tape length rewouned.

The third is that a backspace correction period is provided after the tape is reversed. In the backspace correction period, the system control µP advances the tape while conting the number of C.FG pulses so that the ultimate backspace is 35 mm (C.FG counter reading: 2250) for the SP recorded tape and 17.5 mm for the LP recorded tape. The servo circuit requires a appropriate lock-in time to have stabilized and locked to the reference signal before starting recording. Since it takes 1.5 seconds for the tape to advance the length of the backspace at the SP or LP speed, the backspace provides the lock-in time of 1.5 seconds.

The system control µP is responsible for these controls. The system control µP uses three signals, C.FG, SW25 and the output of the mechanism state switch, to produce the correct backspace.

The C.FG signal is used to measure the length of tape transported. The system control µP accepts the C.FG signal from the servo circuit and supplies it to the internal C.FG counter. When pause is instructed, a negative number which represents the length of two frames is preset to the C.FG counter. The C.FG counter is set to the count-up mode in the reverse mode (REVERSE pin 3 of the system control µP is "Hi"), and is set to the count-down mode in the forward mode. The reverse mode is set after pause is instructed and is held for about 2.3 seconds; during this period the C.FG counter counts up the number of the C.FG pusles. After that the operation mode of the mechanism is switched to the slow mode and the rotation direction of the capstan motor is set to forward and the unit enters the backspace correction period. During the backspace correction period, the tape is transported at the rated speed and the counter counts down the C.FG pulses. When the counter reading reaches the number equivalent to 35 mm (reading; 2250) or 17.5 mm (reading; 1125), the system control µP stops tape running by setting CAPST BRAKE to "Hi" and a correct backspace is left.

During the backspace correction period, the mechanism mode is set to the slow mode and the slow brake engages the capstan flywheel. This is advantageous in stopping the tape quickly to leave a accurate backspace at the end of backspace correction.

The capstan motor is stopped until pause is released.

When pause is released, the speed and phase of the cylinder and capstan motors are controlled by the servo circuit and are locked to the reference signal after a short time.

When the C.FG counter reaches a zero reading which represents that the tape has arrived a position 2 frames before where the new recording is to be started, the system control µP monitors SW25Hz, sets BIAS CONTROL to "Lo" and the servo state to the record mode at the next leading edge of SW25Hz to start recording.

Thus, as recording starts one frame before when the tape returns to the original position, the last frame of the previous recording is recorded twice and this prevents a non-recorded section from being produced. And also the length of overlapping recording which could cause colour noise in playback is minimized to a single frame.

The CURRENT-UP signal is set to "Hi" before recording restarts, and is returned to the original "Lo" after a specified period (SP: 7 sec, LP: 14 sec) has elapsed.

The output of the mechanism state switch is used to set the mechanism to the proper state. A detailed description on the mechanism state is given in the description of the capstan/tape loading control.

REC, BIAS CONT., CURRENT UP and ASBL are output from pins 5, 41 and 26 of the system control µP. The REC and BIAS CONT. signals activate the recording circuits in the luminance, chrominance, audio and pre/rec amplifier.

Commands that controls the servo IC such as ASSEMBLE, REC, PAUSE, etc. are sent to the servo IC via data transfer line DATA(S-SRV) pin 26. When the ASSEMBLE signal is input to the servo IC, the IC is switched to the assemble mode and the cylinder servo is locked to the frame frequency of the video signal to be recorded and the capstan servo is set to the playback state to eliminate the discrepancy of track patterns.

5-8 VHS Index Search System

5-8-1 Outline

When a recording is started, the system control µP records an index signal on the control track via the servo circuit and CTL head. The CTL head regenerates the index signal during fast forward and rewind and applies it to the system control μP. Receiving this, the system control μP performs forward search or Hi-Fi audio playback for approx. 10 seconds and then continues fast forward or rewind. (In this unit, Hi-Fi audio playback is not done.)

Figs. 5-10 and 5-11 show the operation of scanner indexing.

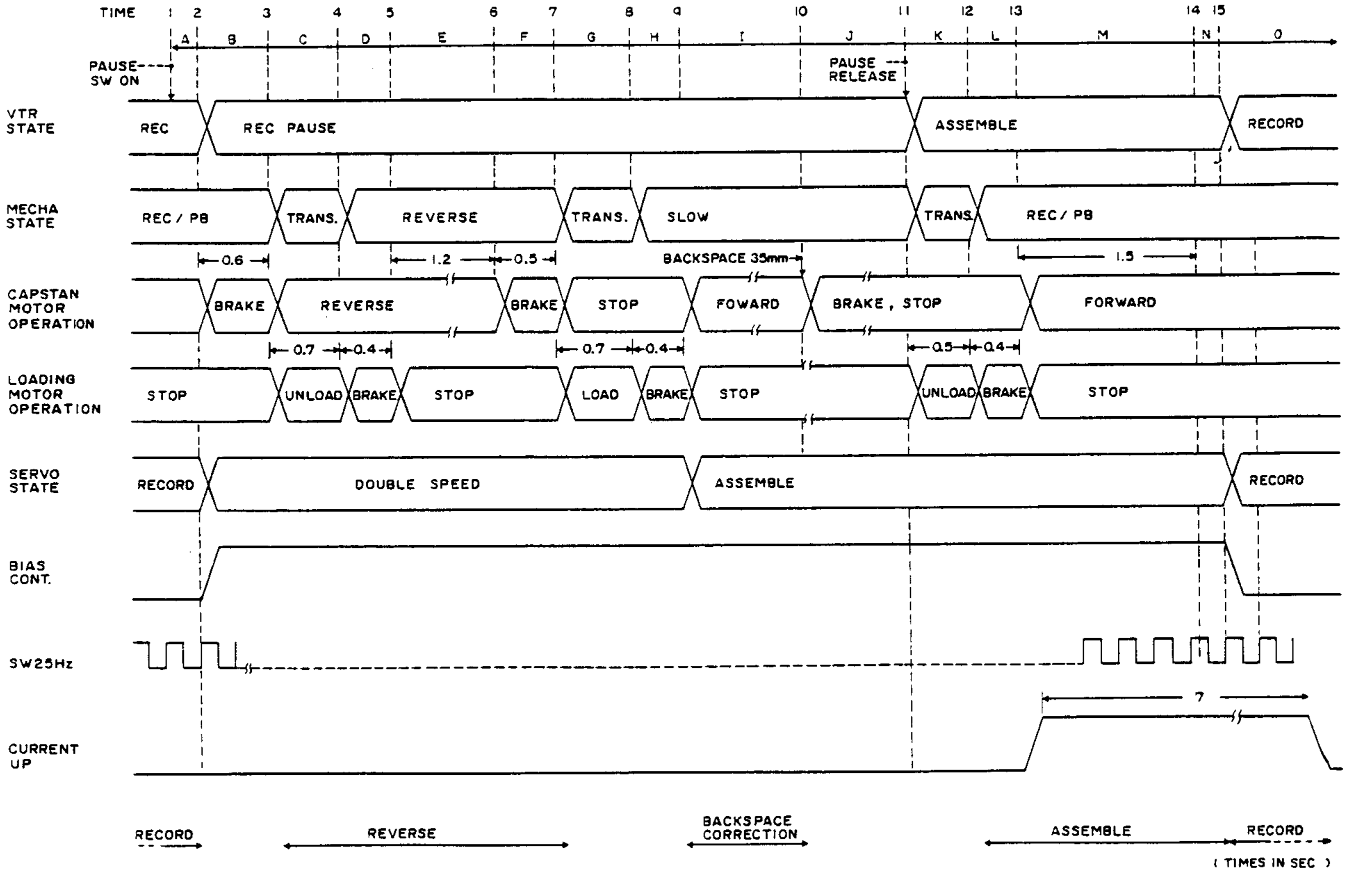

TIME
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
A B C D E F G H I J K L M N O
PAUSE SW ON
PAUSE RELEASE
VTR STATE
REC
REC PAUSE
ASSEMBLE
RECORD
MECHA STATE
REC / PB
TRANS.
REVERSE
TRANS.
SLOW
TRANS.
REC / PB
0.6
1.2
0.5
BACKSPACE 35mm
1.5
CAPSTAN MOTOR OPERATION
BRAKE
REVERSE
BRAKE
STOP
FOWARD
BRAKE , STOP
FORWARD
0.7
0.4
0.7
0.4
0.5
0.4
LOADING MOTOR OPERATION
STOP
UNLOAD
BRAKE
STOP
LOAD
BRAKE
STOP
UNLOAD
BRAKE
STOP
SERVO STATE
RECORD
DOUBLE SPEED
ASSEMBLE
RECORD
BIAS CONT.
SW25Hz
7
CURRENT UP
RECORD
REVERSE
BACKSPACE CORRECTION
ASSEMBLE
RECORD
(TIMES IN SEC)

FiG. 5-10 Edit Control Timing

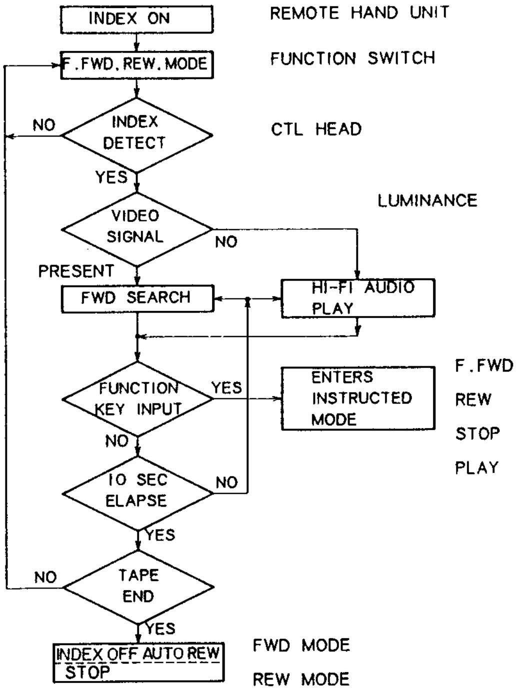

INDEX ON
REMOTE HAND UNIT
F.FWD. REW. MODE
FUNCTION SWITCH
INDEX DETECT
NO
YES
CTL HEAD
VIDEO SIGNAL
LUMINANCE
NO
PRESENT
FWD SEARCH
HI-FI AUDIO PLAY
FUNCTION KEY INPUT
YES
ENTERS INSTRUCTED MODE
F.FWD
REW
STOP
PLAY
NO
10 SEC ELAPSE
NO
YES
TAPE END
NO
YES
INDEX OFF AUTO REW STOP
FWD MODE
REW MODE

Fig. 5-11 Scanner Indexing Flow Chart

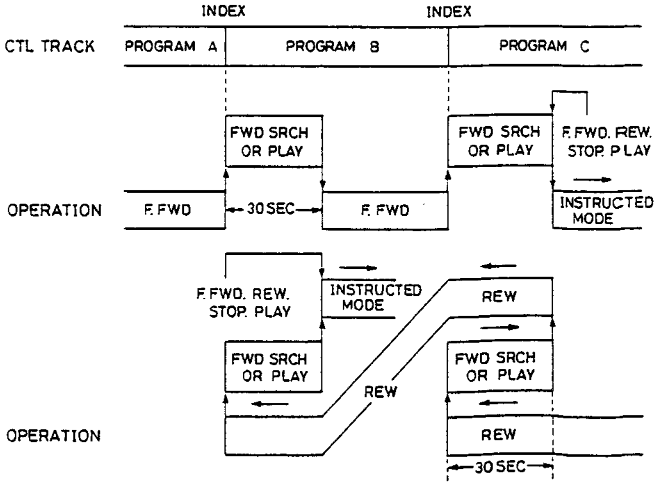

INDEX
INDEX
CTL TRACK
PROGRAM A
PROGRAM B
PROGRAM C
FWD SRCH OR PLAY
FWD SRCH OR PLAY
F.FWD. REW. STOP. PLAY
OPERATION
F.FWD
30SEC
F.FWD
INSTRUCTED MODE
F.FWD. REW. STOP. PLAY
INSTRUCTED MODE
REW
FWD SRCH OR PLAY
REW
FWD SRCH OR PLAY
OPERATION
REW
30SEC

Fig. 5-12 Scanner Indexing Operation

5-8-2 Index Signal Recording

Fig. 5-13 shows the index signal recording and playback circuit.
When "Hi" is applied to VISS ON pin 35, The VISS function of the system control µP becomes active. (VISS: VHS Index Search System)
System control µP IC901 outputs "Hi" from VISS (INDEX) DATA pin 16 when starting recording and applies it to the CTL recording circuit in the servo IC601 for about two seconds. When "Hi" is applied to the REC CTL DUTY SW stage in IC601, the stage changes the duty ratio of the recording CTL signal to 27.5% (normally 60%) and records it on the control track. The CTL signal with the 27.5% duty cycle is called an index signal. The index signal with the 27.5% duty cycle is also called a code 1 pulse and the CTL pulse with the 60% duty cycle is called a code 0 pulse. The frequency of the index signal is 25Hz, that is the same as that of the CTL signal, and performs the same operations as the CTL signal in the servo circuit. Fig. 5-14 shows the waveform of the CTL signal (0 code) and INDEX signal (1 code).
The index signal is recorded before a timer recording, IRT recording or normal recording is started, but when recording pause is released, it is not recorded. When Hi-Fi audio only (without video signal) is recorded, the index signal is also recorded when recording pause is released.

5-8-3 Index Signal Playback

The CTL signal reproduced by the CTL head (Fig. 5-14 b) is amplified and shaped into a square wave (Fig. 5-14 a) by IC602 and then supplied to IC601. IC601 uses the CTL/index signal for capstan phase control, tape speed detection and index signal detection. Receiving the CTL/index signal, the CTL/index duty ratio detector stage measures the duty of the input signal
using a clock pulse derived from the 4.43 MHz carrier. When the duty ratio of the input signal is 27.5 %, the detector judges that the input signal is an index signal, and outputs "Hi" to VISS IN pin 34 of the system control µP via pin 25. When the CTL/index duty ratio detector judges that the input signal is a CTL signal, it outputs "Lo". When the level at INDEX IN pin 34 of the system control µP is "Hi" for a period of 32 CTL pulses, the system control µP starts the index scanner operation.
The CTL signal applied to pin 22 is used to control the timing of brake pulse (During intermittent driving, not used in the VT-M620E series models).

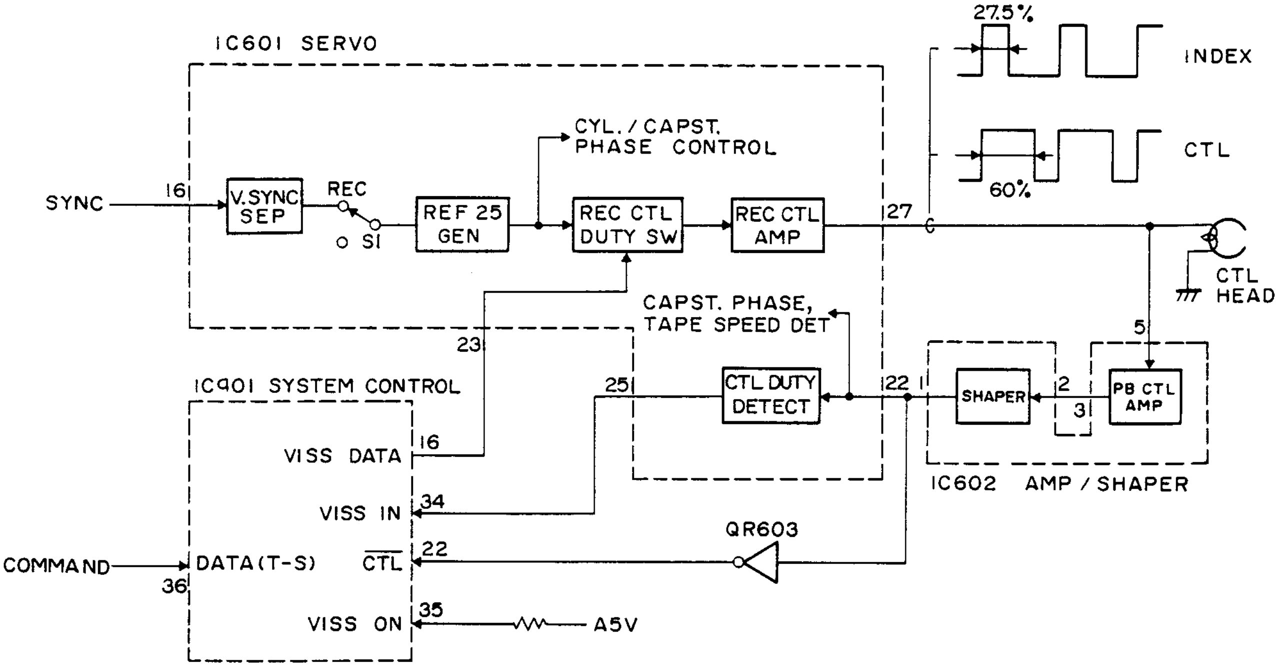

IC601 SERVO
SYNC
16
V.SYNC SEP
REC
S1
REF 25 GEN
CYL./CAPST. PHASE CONTROL
REC CTL DUTY SW
REC CTL AMP
27
27.5%
INDEX
CTL
60%
CTL HEAD
CAPST. PHASE, TAPE SPEED DET
23
25
CTL DUTY DETECT
22
SHAPER
2
3
5
PB CTL AMP
IC602 AMP / SHAPER
IC901 SYSTEM CONTROL
VISS DATA
16
VISS IN
34
QR603
COMMAND
36
DATA (T-S)
CTL
22
VISS ON
35
A5V

Fig. 5-13 Index Recording/Playback Circuit

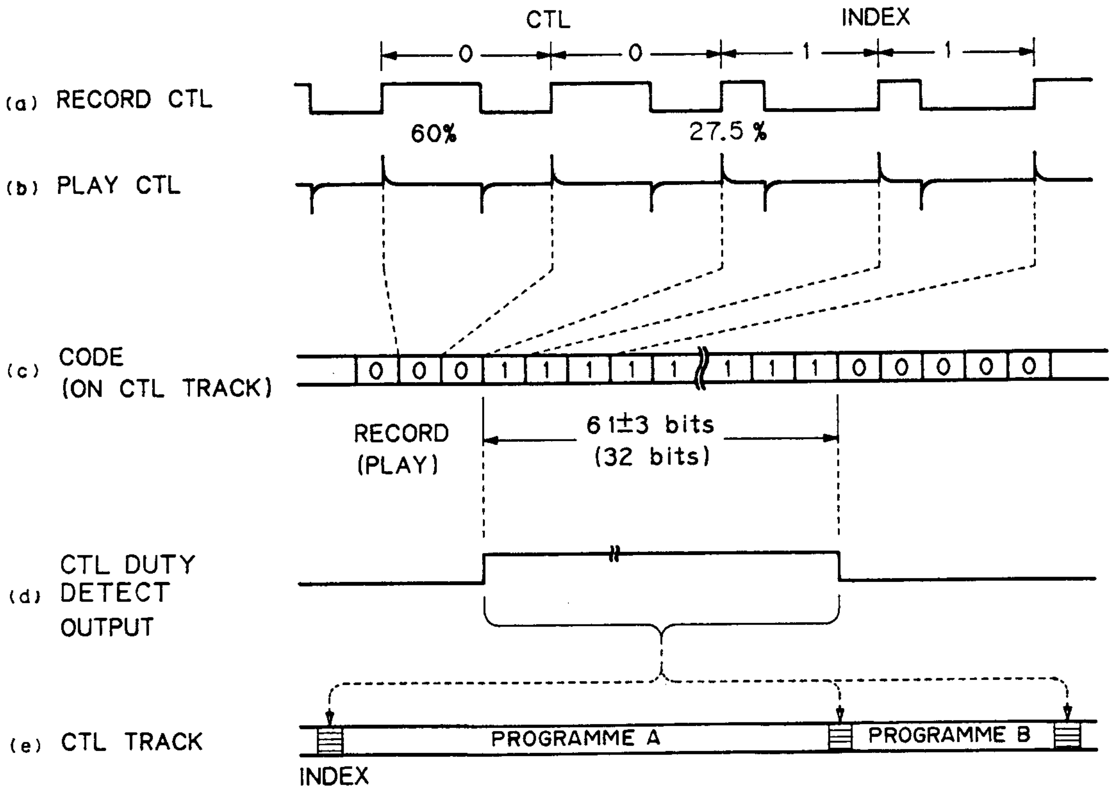

CTL
INDEX
0
0
1
1
(a) RECORD CTL
60%
27.5 %
(b) PLAY CTL
(c) CODE (ON CTL TRACK)
0 0 0 1 1 1 1 1 1 1 1 0 0 0 0 0
RECORD (PLAY)
61±3 bits (32 bits)
(d) CTL DUTY DETECT OUTPUT
(e) CTL TRACK
PROGRAMME A
PROGRAMME B
INDEX

Fig. 5-14 CTL Signal and Index Signal

5-9 Pin Functions of System Control μP (IC901)

<table>
<tr><th>Pin No.</th><th>I/O</th><th>Active Level</th><th>Abbreviation</th><th>Function</th></tr>
<tr><td>1</td><td>O</td><td>Pulse</td><td>ACCEL</td><td>Drives the tape forward when the tape is driven intermittently in the modes such as slow, frame advance and etc.</td></tr>
<tr><td>2</td><td>O</td><td>Hi</td><td>SLOW/PAUSE</td><td>Sets the servo circuit to the pause or slow motion mode.</td></tr>
<tr><td>3</td><td>O</td><td>Hi</td><td>REVERSE</td><td>Sets the rotation direction of the capstan motor to reverse.</td></tr>
<tr><td>4</td><td>O</td><td>Hi</td><td>PLAY</td><td rowspan="2">Sets each circuit to the play or record mode.</td></tr>
<tr><td>5</td><td>O</td><td>Hi</td><td>REC.</td></tr>
<tr><td>6</td><td>O</td><td>Hi</td><td>POWER CONT.</td><td>Outputs "Hi" to activate the regulator and turn the power supplies on. Alternates between "Hi" and "Lo" every time the operate switch is pressed.</td></tr>
<tr><td>7</td><td>O</td><td>Hi</td><td>AUDIO REC</td><td>Sets the audio circuit to the record mode.</td></tr>
<tr><td>8</td><td>O</td><td>Hi</td><td>LOAD</td><td rowspan="2">Drive the loading motor driver to rotate the loading motor in the normal or reverse direction and to set the mechanism to the state commanded. The state of mechanism is detected by the inputs at pins 11, 12 and 13.
<table>
<tr><th></th><th>STOP</th><th>LOAD</th><th>UNLOAD</th><th>BRAKE</th></tr>
<tr><td>Pin 8</td><td>Lo</td><td>Hi</td><td>Lo</td><td>Hi</td></tr>
<tr><td>Pin 9</td><td>Lo</td><td>Lo</td><td>Hi</td><td>Hi</td></tr>
</table></td></tr>
<tr><td>9</td><td>O</td><td>Hi</td><td>UNLOAD</td></tr>
</table>

Pin No.	I/O	Active Level	Abbreviation	Function
10	O	Hi	AUDIO DUB	Sets the audio circuit to the audio dub mode.
11 12 13	I I I	Hi Hi Hi	M. STATE 0 M. STATE 1 M. STATE 2	Detect the operation mode of the mechanism using the rotary mechanism state switch and determine the logic level (Hi or Lo) at pins 8 and 9.

Position	1 EJECT	2 STOP	3 F.F/REW	4 REC PAUSE	5 REVERSE	6 PLAY/REC	7 SLOW	TRANSITION
Pin 11	Hi	Hi	Hi	Hi	Lo	Lo	Lo	Lo
Pin 12	Hi	Hi	Lo	Lo	Hi	Hi	Lo	Lo
Pin 13	Hi	Lo	Hi	Lo	Hi	Lo	Hi	Lo

Pin No.	I/O	Active Level	Abbreviation	Function
14	O	Hi	SEARCH	Sets each circuit to the search mode.
15	O	Hi	QUICK	Outputs "Hi" in the quick (double speed: not provided in this unit) mode to control the servo circuit.
16	O	Hi	VISS DATA (INDEX DATA)	Used by the servo IC to set the duty cycle of the CTL signal to be recorded to approx. 27.5% (equivalent to Code 1) and to record an index signal.
17	O	Hi	TRANSIENT	Outputs "Hi" when the playback mode is switched (PB--STILL--PB) to select suitable video heads in models using the double azimuth 4-head cylinder (not provided in this unit).
18	I	Hi	DATA2(T-S)	Accepts data to be displayed in on-screen display. The system control µP sends the data to the character generator.
19			DISP	Negative power supply.
20	I	Hi	DEW.	Detects condensation in the VTR to inhibit operation keys. (Not used)
21	O	Hi	BLUE BACK	Outputs "Hi" in the modes such as OSD MENU, PROGRAMME REVIEW CALENDAR, etc. when a blue screen is displayed, and controls the OSD circuit. (Not used)
22	I	Pulse	CTL	Determines the timing of the brake pulse output from pin 31 when tape is driven intermittently.
23	I	Pulse	SW 25	1. Monitors the period of SW25Hz to judge whether the rotation of the cylinder motor is normal or not during recording and playback. 2. Determines the timing of the ACCEL pulse output from pin 1 when tape is driven intermittently. 3. Determines the timing to release the assemble mode.
24	O	Hi	$\overline{\text{OSD LOAD}}$	Outputs "Hi" when data is transmitted from pin 26 to the OSD µP and enables the OSD µP to receive the data.

Pin No.	I/O	Active Level	Abbreviation	Function
25	O	Pulse	CLOCK(S-SRV)	Outputs a sync signal for data transfer. This signal times the transfer of the data at pin 26.
26	O	Pulse	DATA(S-SRV)	Outputs control commands for the servo IC. The control commands include PB, REC, REV, F.FWD, SLOW, PAUSE, CYL.ON, SP, etc.
27	O	Hi	SERVO LOAD	Outputs "Hi" when data is transmitted from pin 26 to the servo IC and enables the servo IC to receive the data.
28	O	Hi	CAPST. BRAKE	Applies approx. 1V to the speed control input of the capstan motor driver when braking the capstan motor in a mode other than recording and playback. The capstan motor brakes when a speed control voltage between 0.6 V and 1.75 V DC is applied at the input.
29	O	Hi	CAPST. MODE	Outputs "Hi" to disable the capstan servo in modes other than play, record, search. In this case pins 63 and 64 control the capstan speed.
30	O	Pulse	DM SWAY	Corrects the cylinder speed to reduce the sway of pictures when a tape is driven intermittently.
31	O	Pulse	SLOW BRAKE	Applies a brake to the capstan motor to decelerate the tape in modes in which the tape is driven intermittently.
32	O		Vcc	Connected to the 5V power supply.
33	I	Pulse	C.FG	1. Stops unloading when there is no pulse during unloading to prevent damaging the tape. 2. Used to count the amount of tape transported. The timing of recording restart is determined by counting up and down the C.FG signals to minimize the section of overlapped recording when recording pause is released.
34	I	Hi	VISS IN (INDEX IN)	When the length of "Hi" applied to this pin is longer than 32 periods of the CTL pulse, starts the index search operation.
35	I	Hi	VISS ON	"Hi" Enables VISS (VHS index search system) function.
36	I	Pulse	DATA (T-S)	Receives operation commands from the timer/tuning µP.
37	O	Pulse	DATA (S-T)	Sends data on the mode of operation to the timer/tuning µP
38	O	Pulse	CLOCK (S-T)	Outputs a sync pulse for data communication.
39	O	Pulse	COUNT DATA (S-T)	Sends counter data to the timer/tuning µP. The communications data is composed of 16 bits.
40	O	Hi	CURRENT UP	Increases the recording current of video signal for 7 seconds after the assemble mode is released to reduce rainbow noise occurring in the overlapped sections in playback.
41	O	Hi	BIAS CONT. (MONITOR CUT)	Inhibits the output of video signal to be recorded or played back during loading.
42	O	Hi/Lo	VTR/$\overline{\text{TV}}$	Selects the RF signal (the aerial signal input via the AERIAL IN terminal or the output of the RF converter) to be output via the "RF OUT" terminal of the VTR. (Used for AU model)
43	O	Hi	SIMULCAST	Selects the output of the tuner/demodulator for the video process circuit and the audio signal input via the AUDIO IN jack for the audio processing circuit.

Pin No.	I/O	Active Level	Abbreviation	Function
44	O	Hi/Lo	LINE/$\overline{\mathrm{TUNER}}$	Selects the audio and video input signals, the signals input via the VIDEO IN and AUDIO IN jacks or the signals demodulated by the tuner unit. The selected input signals are supplied to the video and audio processing circuits.
45	I	Lo	$\overline{\mathrm{FWD\ END}}$	Detect the forward and reverse ends of tape.
46	I	Lo	$\overline{\mathrm{REW\ END}}$	
47	I	Pulse	T. REEL	1. Count the period of the take-up reel pulse to check the operation of the tape take-up reel disk is normal or not. 2. Calculate the remaining of tape (time) from the periods of the take-up and supply reel pulses.
48	I	Pulse	S. REEL	
49	I	Hi	RESET	Initializes the μP.
50	I	Lo	$\overline{\mathrm{TEST}}$	Used to check the μP.
51 52			OSC 1 OSC 2	Generate the system clock signal of the μP. The frequency is approximately 4MHz.
53			GND	
54	I	Hi	CST UP/DOWN	Detects the insertion or ejection of a cassette and the completion of loading of the cassette and drives the capstan motor to perform cassette loading or unloading.
55	I	Hi	TAB	1. Enables recording. 2. Ejects the cassette automatically when its safety tab is not in place and timer recording is set.
56	I	Hi	C. PAUSE	Sets the VTR to the pause mode.
57	O	Hi	TRICK PLAY	Outputs "Hi" to the luminance and chrominance circuits to improve picture quality during the search and still modes.
58	O	Hi/Lo	SP/$\overline{\mathrm{LP}}$	Supplies information on tape speed (SP or LP) selected or detected to each circuit to set the tape speed and to switch the amount of preemphasis and deemphasis of video and audio.
59	O	Hi	MAIN MUTE	Mutes the audio signal to be recorded or played back.
60	O	Pulse	P IN P POSI.	Shifts the position of the sub picture. (Not used)
61	O	Hi	P IN P	Frames the sub picture in the main picture. (Not used)
62	O	Hi	P IN P REV.	The sources of the main and sub pictures are swapped. (Not used)
63 64	O O	Hi Hi	CAPST 2 CAPST 1	Determine the power supplly voltage to the capstan motor driver to set the tape speed in modes other than recording and playback.

CHAPTER 6 SERVO CIRCUIT

6-1 General

During recording, the servo system performs the following.

- o Makes the tape run at a fixed tape speed (SP: 23.39 mm/sec, LP: 11.70 mm/sec), so that the video track pitch has rated width (SP: 49 µm, LP: 24 µm).
- o Rotates the video heads at 1500 rpm in synchronization with the TV frame frequency (25 frames/sec) in order to record one TV picture field per video track.
- o Rotates the video heads in such a way that the vertical blanking period of the video signal is always recorded at the bottom end of each video track in accordance with the VHS standard.

During play, the servo system performs the following.

- o Makes the tape run at exactly the same speed as in recording.
- o Rotates the video heads in synchronization with the TV frame frequency so that they accurately trace the recorded video tracks.

For this purpose, speed control and phase control are applied to the capstan motor that runs the tape and the cylinder motor that rotates the video heads.

The speed control system regulates the motor speed over wide speed range to maintain the rated speed of the video heads and tape. The phase control system fine adjusts the position of video heads and video tracks within narrow limited ranges.

Fig. 6-1 shows the configuration of the servo circuit. Table 6-1 shows the reference and comparison signals used for servo control.

The servo circuits consist of the following ICs.

IC601: Controls phases and speeds of the capstan motor and cylinder motor, produces a head switching signal, and changes the capstan motor speed.

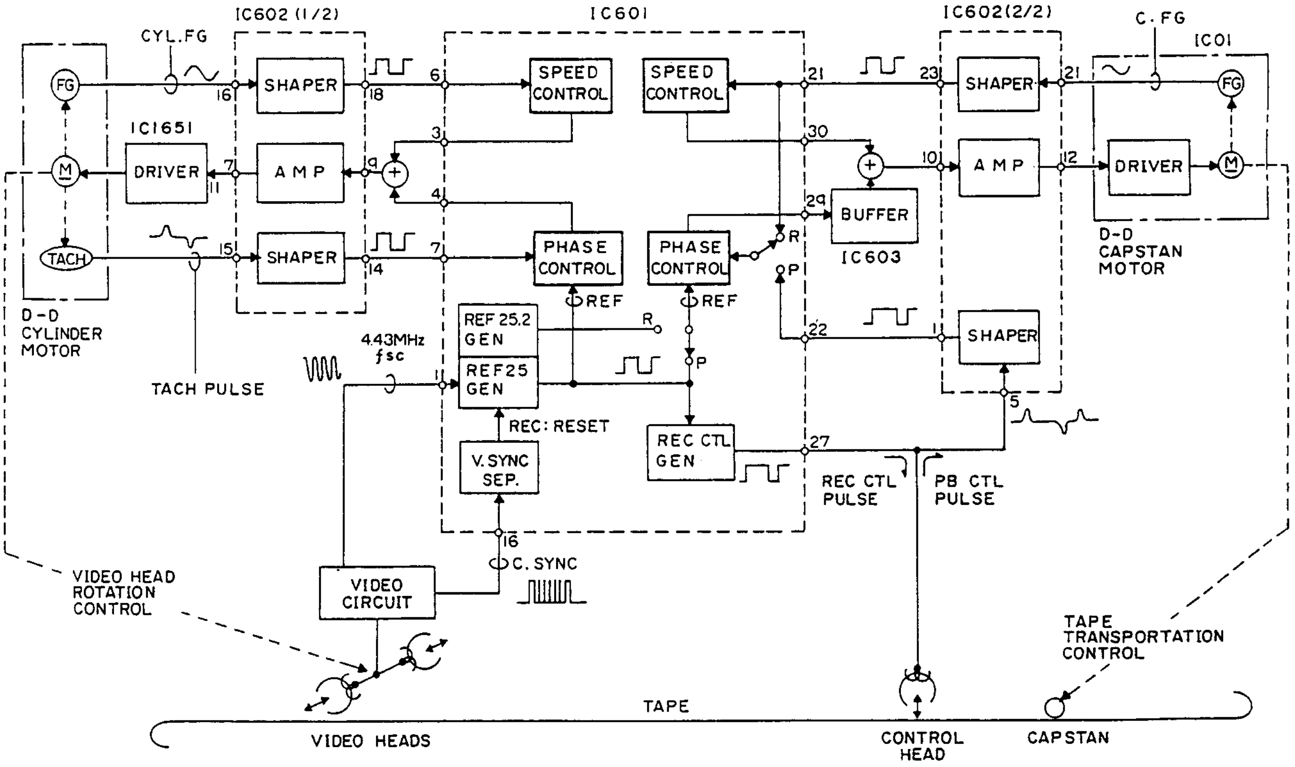

IC602 (1/2)
IC601
IC602(2/2)
C.FG
IC01
CYL.FG
FG
16
SHAPER
18
6
SPEED CONTROL
SPEED CONTROL
21
23
SHAPER
21
FG
IC1651
3
30
M
DRIVER
7
11
AMP
9
+
4
+
10
AMP
12
DRIVER
M
29
BUFFER
IC603
TACH
15
SHAPER
14
7
PHASE CONTROL
PHASE CONTROL
R
P
REF
REF
D-D CAPSTAN MOTOR
REF 25.2 GEN
R
22
1
SHAPER
D-D CYLINDER MOTOR
4.43MHz
fsc
1
REF25 GEN
P
5
TACH PULSE
REC: RESET
REC CTL GEN
27
V.SYNC SEP.
REC CTL PULSE
PB CTL PULSE
16
C. SYNC
VIDEO HEAD ROTATION CONTROL
VIDEO CIRCUIT
TAPE TRANSPORTATION CONTROL
TAPE
VIDEO HEADS
CONTROL HEAD
CAPSTAN

Fig. 6-1 Configuration of Servo Circuit

Table 6-1 Reference and Comparison Signals

Motor	Control System	Mode	Reference Signal	Comparison Signal
Cylinder	Phase	REC	1/2 V. SYNC	Tach pulse (TACH PULSE: 25 Hz)
		PB	REF25Hz	
	Speed	REC/PB		Cylinder FG (CYL. FG: 300 Hz)
Capstan	Phase	REC	REF25.2Hz	Capstan FG (C. FG: 25.2Hz)
		PB	REF25Hz	Control pulse (CTL PULSE: 25 Hz)
	Speed	REC/PB		Capstan FG (C. FG) (SP: 1514 Hz, LP: 757Hz)

IC602: Amplifies the cylinder motor/capstan motor control voltages. It also shapes the waveforms of the PB CTL, TACH, CYL. FG and C. FG signals.

IC1651:Cylinder motor driver.

IC603: Buffer of the capstan phase control voltage. Produces a reference voltage (V. REF).

Table 6-1 Reference and Comparison Signals

IC601 contains the major part of the servo system and uses digital techniques to control the servo system.
The digital servo system uses digital counters that produce digital error data representing speed/phase errors. The error data is used to produce PWM signals digitally, and then the PWM signals are converted to motor speed control DC signals.
The PWM signal has a duty ratio of 50% normally when the motor is running at the rated speed/phase. When the speed or phase is slow or delayed, the counter detects a higher value and the PWM stage increases the duty ratio of the PWM signal according to the detected error data. Receiving the PWM signal with an increased duty ratio, the lowpass filter in the next stage enhances the motor speed control DC signal to advance the phase or to make the speed faster. When the speed or phase is fast or advanced, the PWM stage decreases the duty ratio of the PWM signal.

6-2 Reference and Comparison signals

REF25Hz
The reference signal REF25Hz used in the cylinder and capstan phase control systems, is obtained in the REF25Hz generator stage by dividing the 4.43 MHz signal produced inside the chroma signal processor to 25 Hz. The reference signal REF25.2Hz used for capstan phase control in recording is also obtained by dividing the 4.43 MHz by 175744.
During recording, the REF25Hz generator is reset with the vertical sync signal (V. SYNC) to synchronize the REF25Hz signal with the vertical sync signal.

TACH pulse
The TACH pulse is produced by the tach head provided on the cylinder motor base plate at the time when the tach magnet installed on the rotor magnet of the lower cylinder passes the tach head.
When the cylinder motor is rotating at the rated speed (1500 rpm), the TACH pulse frequency is 25 Hz. The TACH pulse is used as the comparison signal to activate the cylinder phase control system.

Cylinder FG (CYL. FG)
The CYL. FG signal is produced by the FG coil printed on the cylinder motor base plate when the rotor magnet of the lower cylinder rotates, and represents the cylinder motor speed.
When the cylinder motor is running at the rated speed (1500 rpm), the cylinder FG (CYL. FG) frequency is 300 Hz.

Capstan FG (C. FG)
The capstan FG signal is produced by the FG head (composed of variable resistors sensitive to magnetism) installed on the capstan motor base plate when the FG magnets fitted on the circumference of the rotor of the capstan motor rotate.
It represents the capstan motor speed, and when the capstan motor is driving the tape at the rated speed (SP: 23.39 mm/sec, LP: 11.70 mm/sec), the capstan FG (C. FG) frequency is as follows.

Table 6-2 Capstan FG frequency

Mode Tape speed	Record/play (Hz)	Search (Hz)
SP	1514	7570 (x 5)
LP	757	6813 (x 9)

C. FG is also used as the comparison signal during recording for the capstan phase control system.
C. FG is divided by 60 during SP and by 30 during LP, to 25.2Hz, and is compared with REF25.2Hz for phase control.

Control pulse (CTL pulse)
During recording, REF25Hz is triggered by the vertical sync signal and is shaped into a square wave having a duty ratio of 60% and then recorded on the control track by the control head. During play, the control head picks up the playback control pulse from the control track. This control signal is used as the comparison signal for the capstan phase control system. When the capstan motor is driving the tape at the rated speed, the playback control (CTL) pulse frequency is as follows:

Table 6-3 CTL pulse frequency

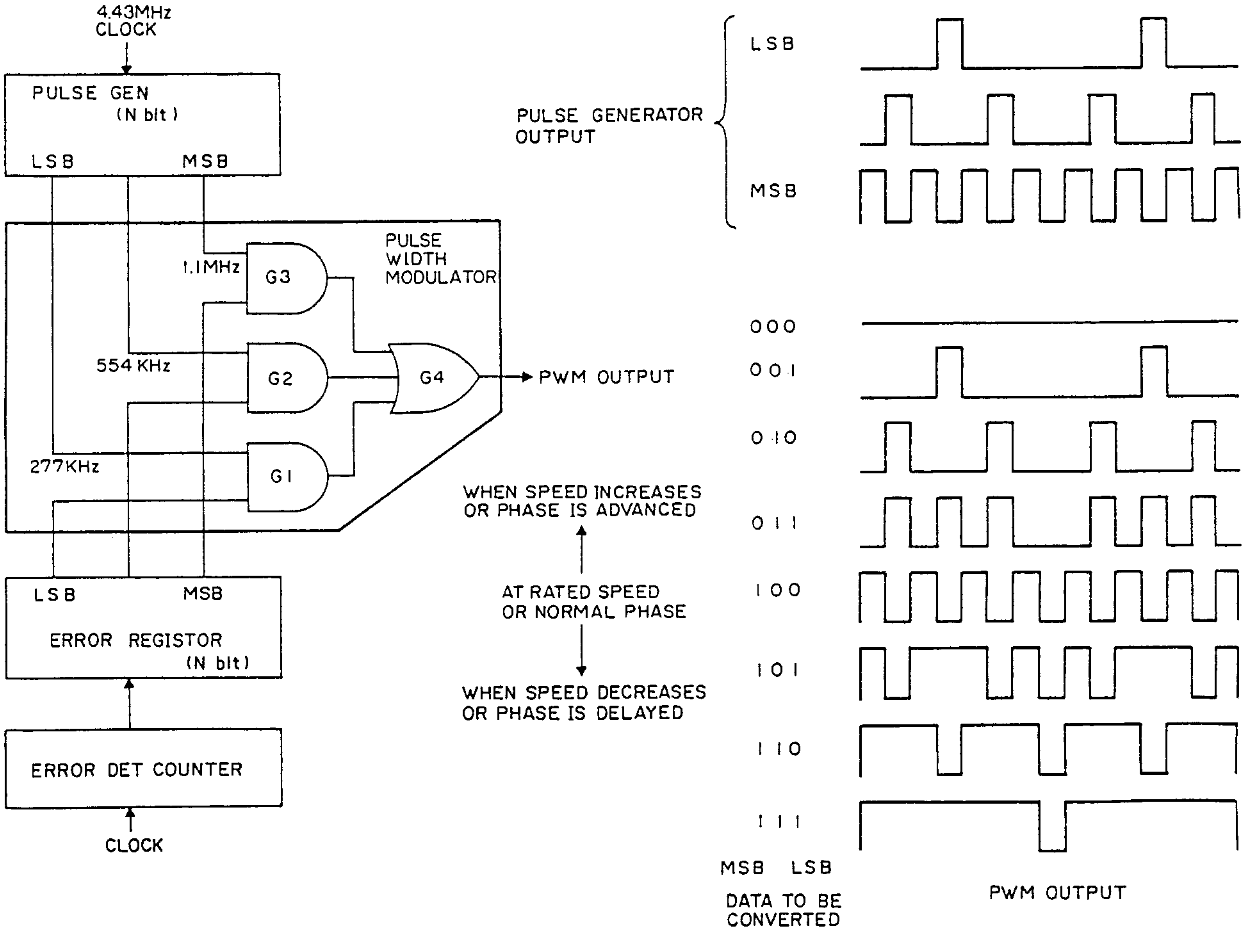
Mode Tape speed	Normal play (Hz)	Search (Hz)
SP	25	125 (x 5)
LP	25	225 (x 9)

Waveshaper: IC602
The PB CTL pulse, TACH pulse, CYL. FG signal and C. FG signal are shaped into square waves by waveshapers in IC602 before they are sent to the speed/phase control systems in IC601. This is performed to prevent malfunctioning of the systems caused by waveform distortion and noise superimposed on the signals.

6-3 Generation of PWM signal

The PWM circuit used for speed/phase control in this unit differs from ordinary PWM circuits to reduce low frequency components contained in the PWM signal and to make the response speed of the servo circuit faster.

Fig.6-2 shows the principle of the generation of the PWM signal and Table 6-4 shows the repetition cycle (lowest frequency) of the PWM signals. The error counter develops a 3-bit (9 or 10 bits in practice) speed/phase error data according to the speed/phase error detected by the counter and stores it in the error register.
When the motor is running at the correct speed or phase, the error digital data is "100".
On the other hand, the repetition pulse genererator receives a 4.43 MHz clock pulse and divides it into 3 of repetition pulses (9 or 10 in practice) and supplies them to the AND gates.
The error digital data will be ANDed with the repetition pulses and the outputs of the AND gates are ORed to become a PWM signal.
When the motor is running at the rated speed or phase, the PWM output frequency is the same as the MSB of the repetition pulse generator (1108 kHz: fsc/4).
The PWM output is smoothed to a DC voltage by an LPF before being supplied to the motor driver.
In this system, because the pulse width of the unit pulse composing the repetition pulses is small (high frequency), the lowpass filter time constant can be reduced and servo response will be quicker.
Differences in the cylinder and capstan control systems are summarized below.



4.43MHz CLOCK
PULSE GEN (N bit)
LSB
MSB
1.1MHz
G3
PULSE WIDTH MODULATOR
554 KHz
G2
G4
PWM OUTPUT
277KHz
G1
LSB
MSB
ERROR REGISTOR (N bit)
ERROR DET COUNTER
CLOCK
PULSE GENERATOR OUTPUT
LSB
MSB
WHEN SPEED INCREASES OR PHASE IS ADVANCED
AT RATED SPEED OR NORMAL PHASE
WHEN SPEED DECREASES OR PHASE IS DELAYED
000
001
010
011
100
101
110
111
MSB LSB
DATA TO BE CONVERTED
PWM OUTPUT

Fig. 6-2 Principle of PWM Signal Generation

Table 6-4 Repetition Cycle of PWM Signals

Motor	Control System	Number of bits (N)	PWM signal Repetition Cycle	Unit pulse frequency
Cylinder	Speed	9	4.330 kHz	1108 kHz (fsc/4)
	Phase	10	2.615 kHz	1108 kHz
Capstan	Speed	10	2.615 kHz	1108 kHz
	Phase	10	2.615 kHz	1108 kHz

fsc:4.433619 MHz, N:The number of binary counters in the error detector

6-4 Configuration of Cylinder Servo Circuit

Fig. 6-3 shows the configuration of the cylinder servo circuit.
The speed and phase of the cylinder motor are controlled by the servo IC (IC601). The CYL. FG signal is fed back to the speed control loop and the TACH pulse is fed back to the phase control loop. The reference signal REF25Hz for the cylinder phase control loop is triggered by the vertical sync and is sychronized with the vertical sync during recording so it differs from the REF25.2Hz for capstant phase control. During play REF25Hz is used in common by the cylinder and capstan phase control loops.

The error signals of the phase and speed control loops are converted to PWM signals, smoothed and added together to form a cylinder motor control voltage. After passing through an output amplifier (IC602), the cylinder motor control signal enters the cylinder motor driver (IC1651) which controls the drive current supplied to the 3-phase DD cylinder motor drive coil to maintain the rated cylinder motor (video heads) speed.
Thus the cylinder motor (video heads) rotates at the rated speed while keeping in synchronization with the recording video signal during recording and it rotates in synchronization with the capstan motor rotation during play.

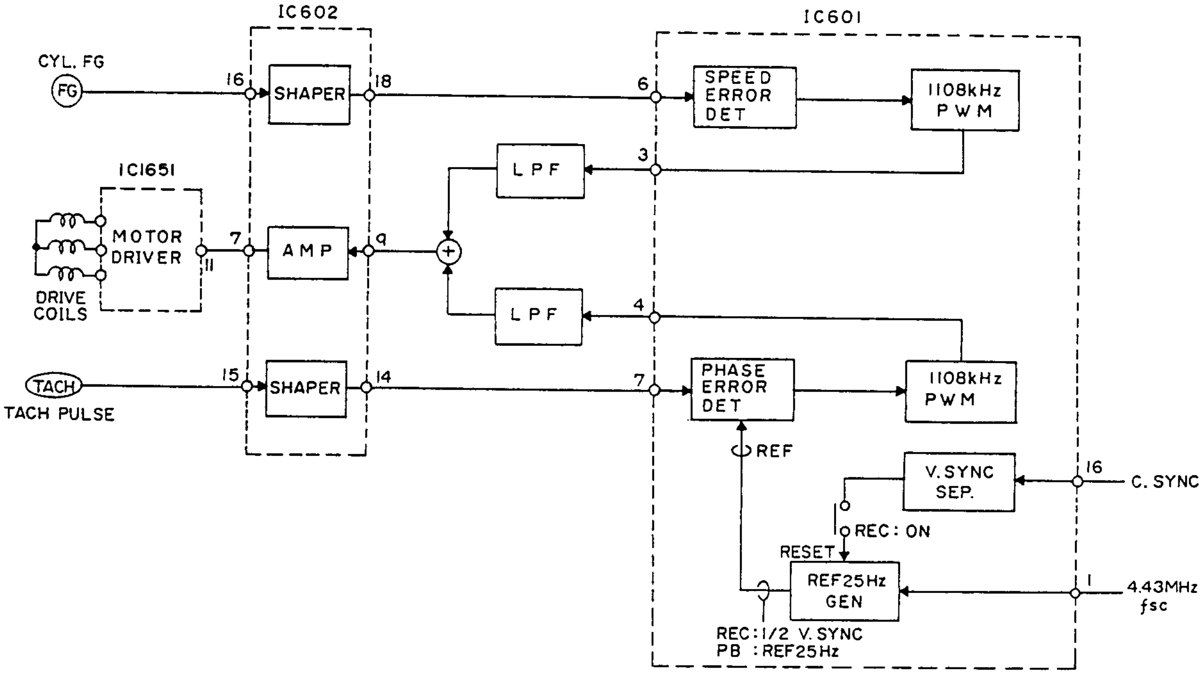

IC602
IC601
CYL. FG
FG
16
SHAPER
18
6
SPEED ERROR DET
1108kHz PWM
3
LPF
IC1651
MOTOR DRIVER
7
AMP
9
+
11
DRIVE COILS
LPF
4
15
SHAPER
14
7
PHASE ERROR DET
1108kHz PWM
TACH
TACH PULSE
REF
V.SYNC SEP.
16
C. SYNC
REC : ON
RESET
REF25Hz GEN
1
4.43MHz fsc
REC:1/2 V. SYNC
PB :REF25Hz

Fig. 6-3 Cylinder Servo Ciruit

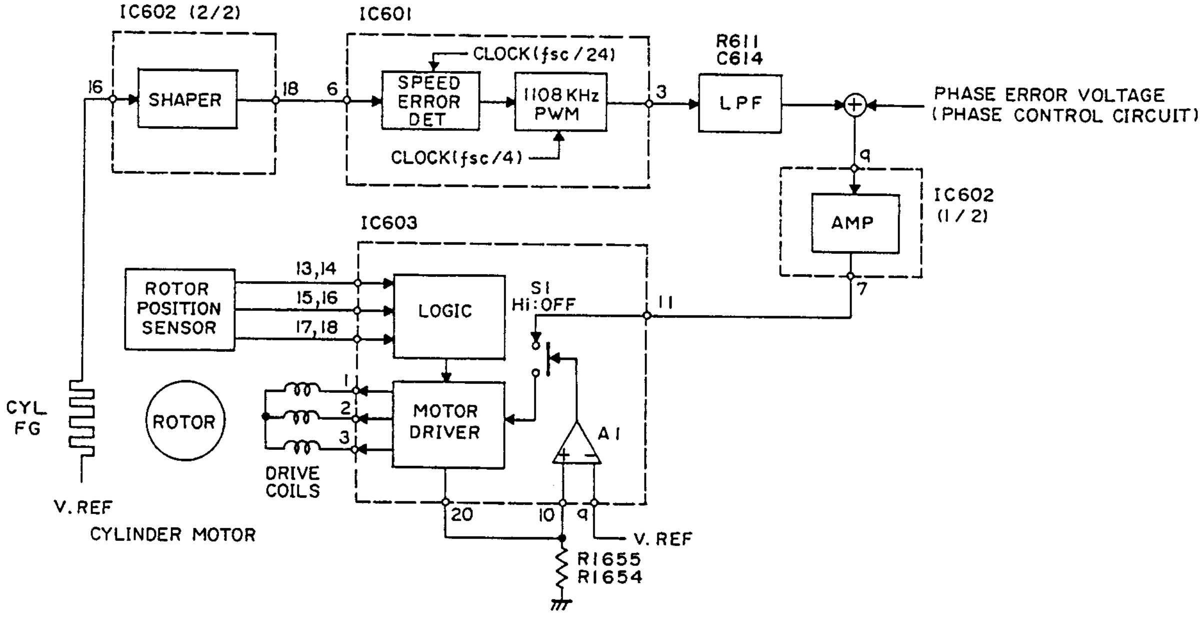

IC602 (2/2)
IC601
CLOCK(fsc/24)
R611
C614
16
SHAPER
18
6
SPEED ERROR DET
1108 KHz PWM
3
LPF
PHASE ERROR VOLTAGE (PHASE CONTROL CIRCUIT)
CLOCK(fsc/4)
9
IC602 (1/2)
AMP
IC603
13,14
15,16
17,18
ROTOR POSITION SENSOR
LOGIC
S1
Hi:OFF
11
7
1
2
3
CYL FG
ROTOR
MOTOR DRIVER
A1
DRIVE COILS
V.REF
CYLINDER MOTOR
20
10
9
V. REF
R1655
R1654

Fig. 6-4 Cylinder Speed Control Circuit

6-5 Cylinder Speed Control

Fig. 6-4 shows the cylinder speed control circuit. The cylinder speed control system maintains the rated speed of the cylinder motor.

The CYL. FG produced in the cylinder motor is shaped into a square wave of 300 Hz by a waveshaping circuit (SHAPER) in IC602 and then supplied to the speed error detector (SPEED ERROR DET) in IC601.

The speed error detector which consists of a digital counter measures the period of CYL. FG, using a 185 kHz clock signal produced from the 4.43 MHz signal by division by 24. The speed error detection counter latches error data at the fall of the CYL. FG pulse and compares the data with preset data so that the lactched data is converted to a 9-bit data.

The 9-bit error data is supplied to the PWM signal modulator stage.

The PWM signal modulator receives the error data from the speed error detector and combines it with the output of the repetition pulse generator included in the PWM generator to produce a 1108 kHz PWM signal.

- o When the speed of the cylinder motor is 1500 rpm, the latched data is the same as the preset data (616) and is converted to a 9-bit number 1 0000 0000. In this case, the PWM modulator produces a PWM signal with a duty ratio of 50%.
- o When the speed rises above 1500 rpm, the latched data is smaller than the preset data and the converted data is less than 1 0000 0000 and the duty ratio of the PWM signal will be lowered to lower the speed.
- o When the speed falls below 1500 rpm, the duty ratio of the PWM signal will be raised to increase the speed.

The speed control PWM signal produced in this way is output via pin 3 to a LPF (R611, C614) which smooths the PWM signal to a DC voltage. It then adds the phase control DC signal supplied from the cylinder phase control system, and the summed output enters the cylinder motor driver (IC1651: CYL. DRIVER) via the output amplifier (IC602: AMP).

The cylinder motor driver, receiving 3-phase information indicating the position of the rotor via pins 13-18, controls the current supplied to the 3-phase drive coil connected to pins 1-3 in such a way that the magnetic field produced attracts/repels the rotor magnet, that is a rotating magnetic field appears. As the torque produced by the rotating magnetic field is proportional to the motor drive current, the speed of rotation depends on the speed/phase error voltage applied via pin 11.

S1 and AMP1 form an overcurrent protection circuit. The amount of drive current flowing through the 3-phase drive coil can be measured by monitoring the voltage appearing across R1654/R1655. AMP1 compares the voltage with the reference voltage available at pin 9 and, if the voltage across R1654/R1655 is higher than the reference voltage, it considers the current to be excessive and cuts off S1.

Correcting fH during trick play modes

In trick play, since the tape speed differs from the normal speed, the relative speed between the tape and video heads varies. This variation of relative speed causes the horizontal sync frequency (fH) to vary, leading to skewing of the image. To correct this, the speed error detector shifts the cylinder motor speed so that the horizontal sync frequency is as rated in the trick play mode. This is actually performed by varying the preset data of the digital counter. Table 6-5 shows the cylinder speed in the trick play mode.

Table 6-5 Preset data

Mode	Tape speed	Preset data	CYL. FG frequency (Hz)	Cylinder motor rpm (rpm)
Record, play, record pause	SP/LP	616	300	1500
Still, slow, frame advance	SP LP		298 299	1492 1496
Forward search	SP LP		306 306	1529 1529
Reverse search	SP LP		292 293	1458 1464

6-6 Cylinder Phase Control

Fig. 6-5 shows the cylinder phase control circuit.

The cylinder phase control system starts to work after the cylinder speed has reached the rated speed (1500 rpm). It performs control so that the vertical blanking period of the video signal to be recorded is aligned at the bottom edge of the tape during recording and that the recorded tracks are traced accurately during play.

The phase of the video heads (cylinder motor) rotation is controlled by the 1108 kHz PWM signal. When the phase of the video heads (cylinder) is the same as the reference phase, the PWM signal has a duty ratio of 50%. The phase error between the cylinder and the reference phase is detected by a digital counter and used to vary the duty ratio of the PWM signal. To perform this control, the phase control circuitry compares the phase of the TACH pulse with the V. SYNC signal extracted from the video signal to be recorded during recording. During playback, it compares the TACH pulse phase with the REF25Hz signal that is used in common as the reference phase for the capstan and cylinder control.

1) Generation of SW25Hz head switching signal

Fig. 6-6 shows the generation of the head switching pulse.

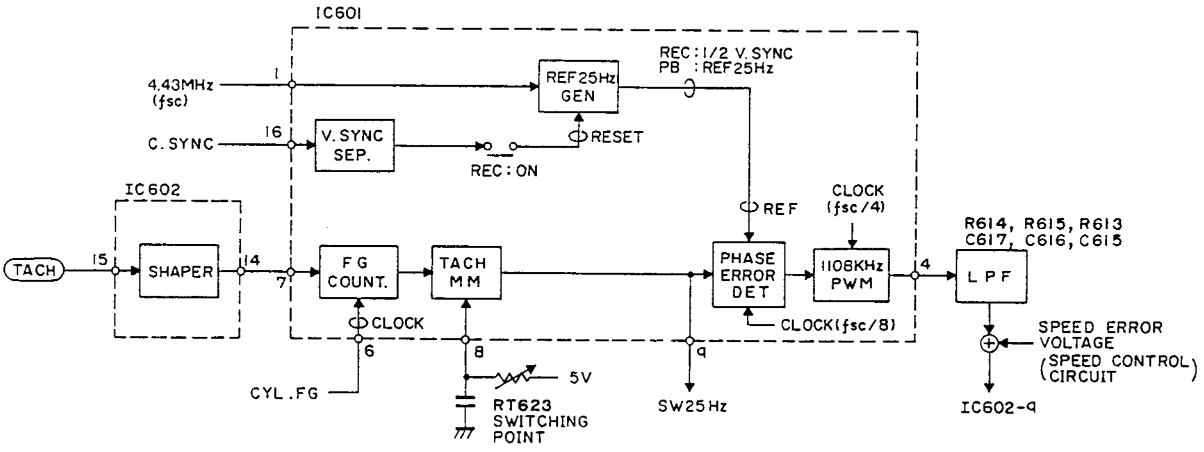

IC601
4.43MHz (fsc)
1
REF25Hz GEN
REC : 1/2 V. SYNC
PB : REF25Hz
C. SYNC
16
V. SYNC SEP.
RESET
REC : ON
IC602
CLOCK (fsc/4)
REF
R614, R615, R613
C617, C616, C615
TACH
15
SHAPER
14
7
F G COUNT.
TACH MM
PHASE ERROR DET
1108KHz PWM
4
L P F
CLOCK
CLOCK(fsc/8)
6
8
9
5V
SPEED ERROR VOLTAGE (SPEED CONTROL CIRCUIT)
CYL .FG
RT623 SWITCHING POINT
SW25Hz
IC602-9

Fig. 6-5 Cylinder Phase Control Circuit

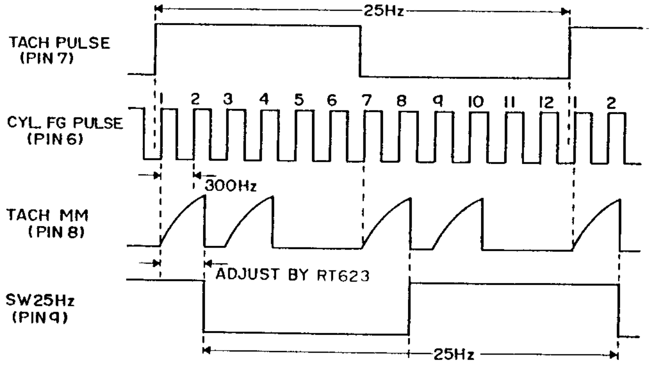

25Hz
TACH PULSE (PIN 7)
1 2 3 4 5 6 7 8 9 10 11 12 1 2
CYL. FG PULSE (PIN 6)
300Hz
TACH MM (PIN 8)
ADJUST BY RT623
SW25Hz (PIN 9)
25Hz

Fig. 6-6 Generation of Head Switching Pulse (SW25Hz)

SW25Hz is produced from the TACH pulse, by correcting the timing of the TACH pulse.
The TACH pulse supplied from the cylinder motor is shaped into a 25 Hz square wave by a waveshaping circuit (SHAPER) in IC602 before being applied to the reset input of the CYL. FG counter (CYL. FG COUNT.) in IC601.
The frequency of the CYL. FG pulse is 300 Hz and the period of the TACH pulse is 12 times as long as that of the CYL. FG pulse.
The CYL. FG counter starts to count CYL. FG pulses at the rising edge of the TACH pulse, detecting the timing of the first and seventh CYL. FG pulses. The first and seventh CYL. FG pulses indicate two positions which are close to the video heads and are accurately 180° apart from each other. The detected timings will be adjusted by the tach monostable multivibrator (TACH MM) to compensate for physical fabrication errors existing between the tach magnet and video heads. The tach monostable multivibrator sets the leading and trailing edges of the SW25Hz at 6.5H ahead of the vertical sync signal with RT623.
The SW25Hz signal produced in this way is output via pin 9 as the head switching pulse and, at the same time, supplied to the cylinder phase error detector (PHASE ERROR DET) for comparison with the reference signal.

2) Phase comparison
During recording, the REF25Hz signal has the same phase as V. SYNC since the REF25Hz generator is reset with the vertical sync signal (V. SYNC) of the video signal.
The phase error detector which consists of a digital counter counts the time difference between the SW25Hz and reference signal in reference to the 554 kHz clock signal produced from the 4.43 Hz carrier signal, and converts the obtained count data to 10-bit data. The 10-bit cylinder phase error data is supplied to a PWM signal generator, where it varies the duty ratio of the PWM signal consisting of 1108 kHz unit pulses.

- When the phase of cylinder motor rotation is correct, the PWM signal has a duty ratio of 50%.
- When the phase of cylinder motor rotation is advanced, the duty ratio of the PWM signal will be lowered by the error data to correct the phase.
- When the phase of cylinder motor rotation is delayed, the duty ratio of the PWM signal will be raised.

In the following cases, the PWM signal always has a duty of 50%.

- The frequency of CYL. FG is more than ±5% from the rated value.
- In the trick play modes (search, still).

In the fast-forward, rewind and stop modes, the output of the PWM signal is fixed to
"Lo" level to stop the cylinder motor.
The cylinder phase control PWM signal passes through pin 4 and enters an LPF (R613-R615, C615-C617), which smooths the PWM signal to a DC voltage. The cylinder phase control signal is then added to the speed control DC signal. After this, the summed control signal proceeds as in the speed control system.

6-7 Configuration of Capstan Servo Circuit

Fig. 6-7 shows the configuration of the capstan servo circuit.
The servo IC (IC601) performs speed/phase control of the capstan motor. The C. FG signal is used as the comparison signal for the capstan speed control loop. The C. FG signal is also used as the comparison signal in the capstan phase control loop during recording while the CTL pulse is used during play.

The reference signal of the phase control loop for recording differs from that for play. The frequency of REF25.2Hz signal for recording is 25.2266Hz to exactly match the frequency of the C.FG25.2Hz obtained by dividing the C. FG by 60. In playback, REF25Hz is used for capstan phase control loop just as in the cylinder phase control loop.

Error signals in the speed and phase loops are PWM-converted, smoothed and then added together to become the capstan motor speed control voltage. This passes through an output amplifier (IC602) and enters the capstan motor driver (built into the capstan motor). The speed of capstan motor rotation (tape travel speed) is kept at the rated value by controlling the current supplied to the drive coil of the 3-phase direct drive (DD) capstan motor.
As a result, the capstan motor runs at the rated speed during recording and during play.

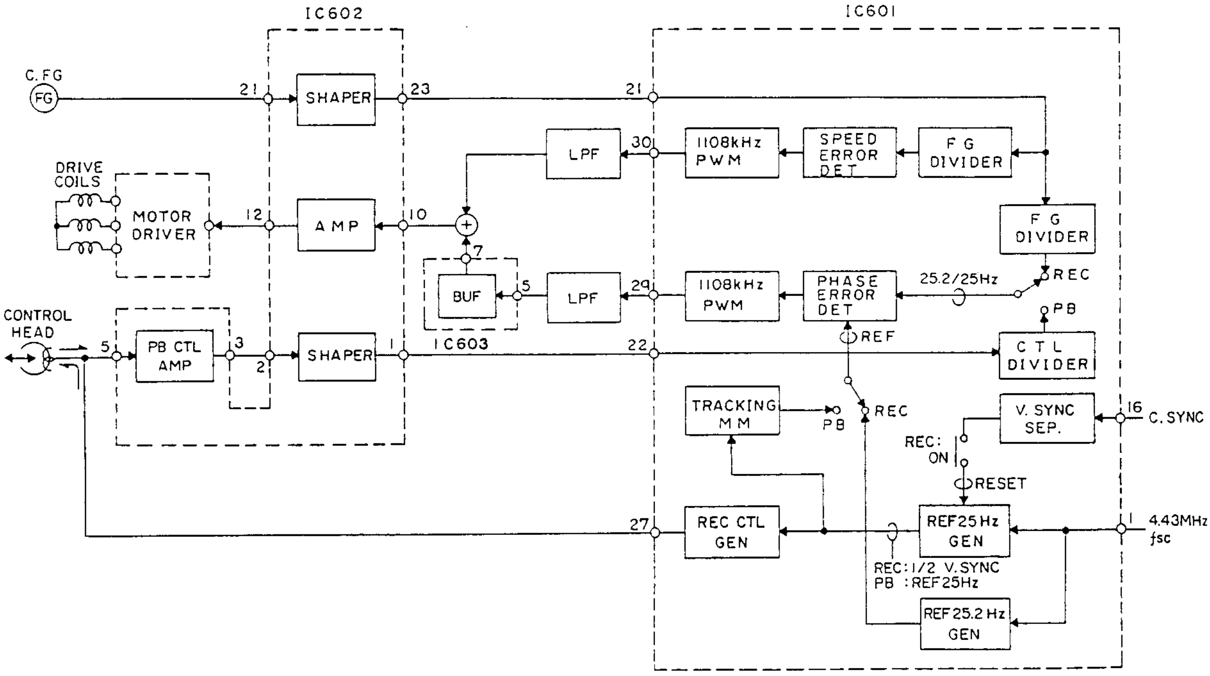

IC602
IC601
C.FG
FG
21
SHAPER
23
21
LPF
30
1108kHz PWM
SPEED ERROR DET
F G DIVIDER
DRIVE COILS
MOTOR DRIVER
12
AMP
10
+
7
F G DIVIDER
BUF
5
LPF
29
1108kHz PWM
PHASE ERROR DET
25.2/25Hz
REC
PB
CONTROL HEAD
5
PB CTL AMP
3
2
SHAPER
1
IC603
22
REF
C T L DIVIDER
TRACKING MM
PB
REC
V. SYNC SEP.
16
C. SYNC
REC: ON
RESET
27
REC CTL GEN
REF25Hz GEN
1
4.43MHz fsc
REC: 1/2 V.SYNC
PB : REF25Hz
REF25.2Hz GEN

Fig. 6-7 Capstan Servo Circuit

6-8 Capstan Speed Control

Fig. 6-8 shows the capastan speed control circuit.
The capstan speed control system keeps the tape speed as follows:

o Record/play (SP: 23.39 mm/sec, LP: 11.70 mm/sec)
o Search (SP: 5 times faster, LP: 9 times faster)
o Fast-forward/rewind (In these modes, the time required to take up or rewind the tape is controlled to be constant.)

The speed control circuit monitors the period of the C. FG signal to perform the above control.

The C. FG signal from the capstan motor is shaped into a square wave by a waveshaping circuit in IC602 and sent to the C. FG divider (C. FG DIVIDER) in IC602.

The frequency of the C. FG pulse which varies with the tape speed must be kept constant. This is performed by switching the division ratio at the C. FG divider according to the tape speed. Division by 2 is done in the SP mode and no division is done in the LP mode. Division is done by 5 in the SP search modes, by 9 in the LP search mode, and by 10 in the fast-forward/rewind modes. The output of the divider is supplied to a speed error detector (SPEED ERROR DET). The speed error detector which consists of a digital counter counts the period of the C. FG pulse in reference to the 1478 kHz clock signal produced from the 4.43 MHz signal by division by 3, and converts the error data into a 10-bit data the centre value of which is 512, which will be supplied to the PWM (unit pulse: 1108 kHz) signal generator to

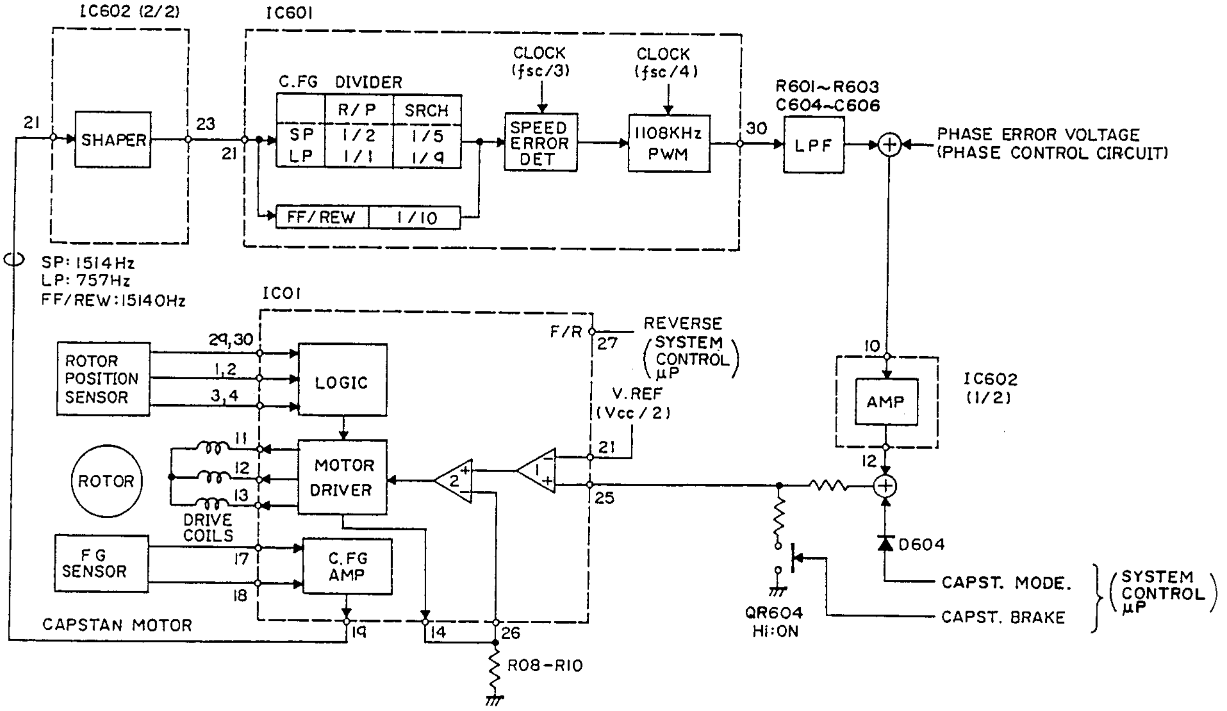

IC602 (2/2)
IC601
21
SHAPER
23
21
C.FG DIVIDER
R/P
SRCH
SP
1/2
1/5
LP
1/1
1/9
FF/REW
1/10
CLOCK (fsc/3)
SPEED ERROR DET
CLOCK (fsc/4)
1108KHz PWM
30
R601~R603
C604~C606
LPF
PHASE ERROR VOLTAGE
(PHASE CONTROL CIRCUIT)
SP: 1514Hz
LP: 757Hz
FF/REW: 15140Hz
IC01
ROTOR POSITION SENSOR
29,30
1,2
3,4
LOGIC
ROTOR
11
12
13
DRIVE COILS
MOTOR DRIVER
F/R
27
REVERSE
(SYSTEM CONTROL µP)
V.REF
(Vcc/2)
21
1
2
25
10
AMP
IC602 (1/2)
12
D604
FG SENSOR
17
18
C.FG AMP
CAPSTAN MOTOR
19
14
26
R08-R10
QR604
Hi:ON
CAPST. MODE.
CAPST. BRAKE
(SYSTEM CONTROL µP)

Fig. 6-8 Capstan Speed Control Circuit

regulate the duty ratio of the PWM signal.

The method to vary the PWM signal is the same as in the cylinder speed control system.

The level of the PWM signal is fixed to "Lo" in the still and stop modes.

The PWM signal converted from the error data passes through pin 30 and enters a LPF (R601-R603, C604-C606), which smooths the PWM signal to a DC voltage. It then adds this to the phase control DC signal from the capstan phase control system. The added output passes through the output amplifier (IC602: AMP) before being supplied to the capstan motor driver (IC01: CAPST. DRIVER).

The capstan motor driver, receiving a 3-phase signal indicating the position of the rotor via pins 29-30 and 1-4, switches the direction of the current supplied to the 3-phase drive coil connected to pins 11-13 to produce a rotating magnetic field. The rotating magnetic field repels/attracts the rotor magnet to rotate the rotor magnet. The direction of the rotating magnetic field is determined by the voltage level applied to pin 27.

When "Hi" is applied to pin 27, the capstan motor rotates in reverse so the tape runs backward.

6-9 Capstan Phase Control

Fig. 6-9 shows the capstan phase control circuit

The capstan phase control system starts to work when the speed control system has established the rated speed of the capstan motor. During recording, it works together with the speed control system to maintain the rated tape speed. During play, it controls tape travel so that the video heads can trace the recorded tracks accurately.

The phase of the capstan motor rotation is controlled with the 1108 kHz PWM signal. When the phase of the comparison signal coincides with the reference phase, the PWM signal has a duty ratio of 50%. The deviation from the reference phase is detected by a digital counter and is used to regulate the duty ratio of the PWM signal. To perform this control, the phase control circuit compares the C. FG pulse with REF25.2Hz during recording, and the CTL pulse with REF25Hz during play.

1) Operation during recording

The 1514Hz C. FG signal from the capstan motor is shaped into a square wave with a waveshaping circuit (SHAPER) in IC602 and sent to the C. FG divider (C. FG DIVIDER) in IC602.

The frequency of the C. FG pulse which varies with the tape speed must be kept constant. The C. FG divider divides the C. FG pulse by 60 for the SP mode and divides by 30 for the LP mode to produce the C. FG25.2HZ (accurately 25.2277Hz).

C. FG25.2Hz is supplied to the capstan phase detector. The phase detector which consists of a digital counter counts the time difference between C. FG 25.2Hz and REF 25.2Hz in reference to the 185 kHz clock signal produced from the 4.43 MHz signal by division by 24. And the phase detector develops 10-bit data indicating the time difference and supplies it to the PWM signal generator.

The PWM signal generator varies the duty ratio of the PWM signal according to the 10-bit phase error data. The repetition

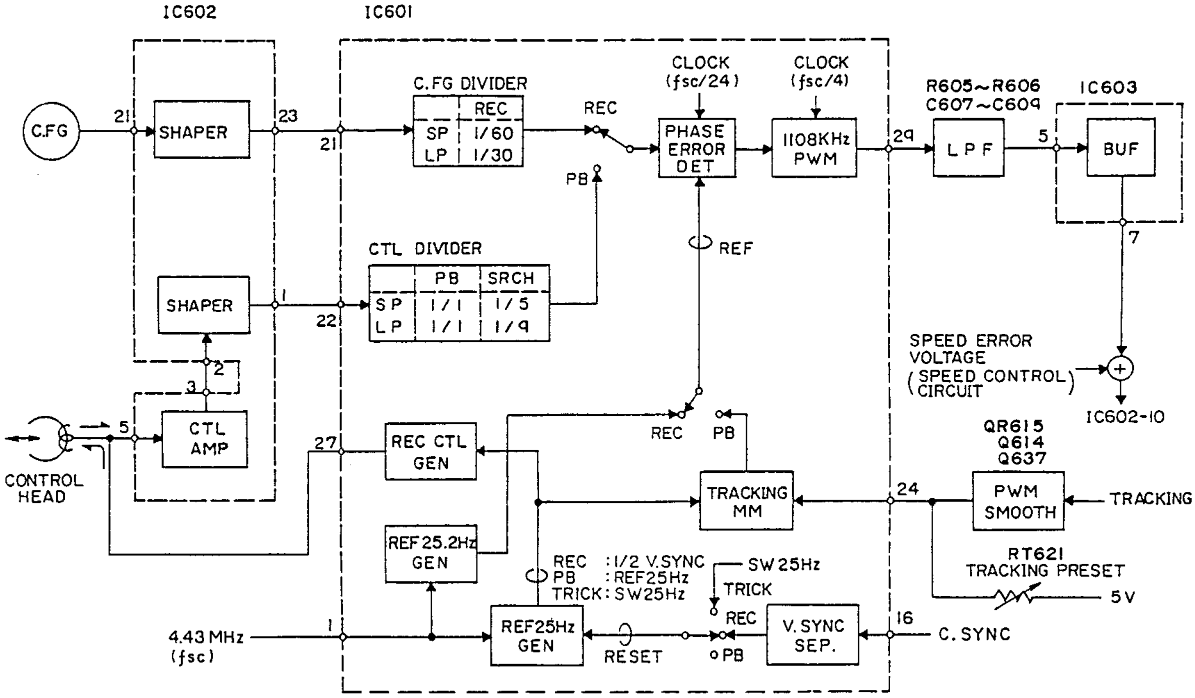

IC602
IC601
C.FG
21
SHAPER
23
21
C.FG DIVIDER
REC
SP 1/60
LP 1/30
REC
PB
CLOCK (fsc/24)
CLOCK (fsc/4)
PHASE ERROR DET
1108KHz PWM
29
R605~R606
C607~C609
LPF
5
IC603
BUF
7
REF
CTL DIVIDER
PB
SRCH
SP 1/1 1/5
LP 1/1 1/9
SHAPER
1
22
2
3
SPEED ERROR VOLTAGE (SPEED CONTROL CIRCUIT)
+
IC602-10
5
CTL AMP
CONTROL HEAD
27
REC CTL GEN
REC
PB
QR615
Q614
Q637
TRACKING MM
24
PWM SMOOTH
TRACKING
REF25.2Hz GEN
REC :1/2 V.SYNC
PB :REF25Hz
TRICK:SW25Hz
SW25Hz
TRICK
RT621
TRACKING PRESET
5V
4.43MHz (fsc)
1
REF25Hz GEN
RESET
REC
PB
V.SYNC SEP.
16
C.SYNC

Fig. 6-9 Capstan Phase Control Circuit

cycle of the PWM signal is 2.615kz and its one period contains 512 pulses of 1108KHz unit pulse if there is no phase error.
The PWM signal generator varies the duty ratio by varying the number of 1108kHz pulses contained in a period of repetition cycle 2.615kHz.
The capstan phase error control PWM signal passes pin 29 and enters an LPF (R605-R606, C607-C609), which smooths the PWM signal to a DC voltage. It then adds the speed control DC signal supplied from the capstan speed control system. After this, the operation of the circuit is the same as in the speed control system.

2) Recording CTL (control) signal

As the REF25Hz generator is reset with the vertical sync signal at 25 Hz during recording, the REF25Hz signal has the same phase as the vertical sync signal. The recording CTL pulse generator (REC CTL GEN) shapes the REF25Hz signal to a square wave with a duty ratio of 60%. This pulse signal will be recorded on the tape's control track by the control head as a video track identification signal. During play, it will be compared with the reference signal in the capstan phase control system.
When "Hi" is applied to pin 23, the duty ratio of the recording CTL signal is switched to 27.5% to record an index signal.

3) Operation during play

The playback CTL pulse signal is compared with REF25Hz to control tape travel so that the video heads accurately trace the recorded tracks. As the CTL pulse is 25 Hz regardless of the tape speed, no division is necessary.
The phase of the REF25Hz signal can be adjusted manually during play. The purpose of phase adjustment is to assure optimum tracking to obtain maximum playback output from the video heads. This adjustment can be done by varying the level at pin 24. RT621 is used to adjust tracking when the same unit is used for both recording and playing back. External adjustment is done with the tracking UP/DOWN switch provided behind the secondary control door. Initially after loading a tape, the tracking PWM signal (TRACK) supplied from the timer µP has a duty ratio of 50%. A smoothing circuit (QR615, Q614, C637: PWM SMOOTH) smooths the signal to a DC voltage. If you press the tracking switch, the duty ratio of the PWM signal varies in a range of 64 steps, causing the smoothed voltage and therefore tracking to vary.

4) Operation in search mode

In the search mode, the frequency of the CTL pulse varies with tape speed (SP: 5 times faster, LP: 9 times faster). However the comparison signal for the phase detector must be constant in all cases. Therefore the CTL frequency will be converted to 25 Hz by frequency division by 5 in the SP search mode and by 9 in the LP search mode.
The reference signal, REF25Hz, is reset with the SW25Hz signal. This is because the speed of the cylinder motor is shifted as shown on Table 6-5 in order to maintain the relative speed between the tape and video heads and to obtain the rated horizontal sync frequency at each tape speed. It is equivalent to bringing the CTL pulse in phase with the TACH pulse. Eventually the noise band will be fixed on the screen.

5) Fixing PWM output

In the following cases, the phase control system stops working and the PWM output has always a duty ratio of 50%.

o The frequency of CYL. FG is more than ±10% away from the rated value.
o The frequency of C. FG is more than ±5% away from the rated value.
o CTL pulse cannot be detected.
o In fast-forward, rewind.

In the following modes, it is fixed at "Lo" level.

o In pause and stop modes.

6-10 Tape Speed Selecting/Detecting

The servo IC601 is provide with the tape speed selecting and detecting functions. The tape speed can be selected during recording, but it is automatically discriminated during play. (LP speed is provided in the UK model)

1) Selection in recording mode

SP and LP modes alternate every time the LP/SP switch on the remote control is pressed except in the record/play and search modes, and the information is transmitted in the form of serial data from the system control µP to the servo IC. According to the data, the servo IC determines the capstan speed and sets the corresponding pin 18 (SP) or pin 19 (LP) to "Hi" level. In the record mode, pressing the SP/LP switch does nothing (except in the record pause mode).

2) Discriminating in play mode

During playback, the servo IC monitors the frequency of the playback control (CTL) signal and switches the tape speed so that the CTL frequency becomes 25Hz. The playback CTL signal is applied to a counter in the speed detector stage via pin 22 of IC601. The counter uses a clock pulse obtained by dividing the 4.43MHz reference signal to measure the period (frequency) of the playback CTL pulse. The measured data is supplied to the tape speed discrimination stage. When the frequency of the playback CTL, fCTL, is higher than 18 Hz and is equal to or lower than 37 Hz , the tape speed discrimination stage judges that the playback tape speed is normal and holds the tape speed select signal outputs at pins 18 and 19 as they are. When the fCTL is 18 Hz or lower, the tape speed discrimination stage judges that the playback tape speed is slow and sets pin 18 (SP) to "Lo" and pin 17 (LP) to "Hi".

In the slow, still or frame advance mode, the tape speed discrimination circuit holds the speed select outputs which have been set before these modes were entered. In this unit, the SP search speed is 5 times the normal SP playback speed, and the frequency of the playback CTL pulse is 5 times that of the normal SP playback CTL pulse. In the search mode, the counter in the speed detector stage measures the length of 5 periods of the CTL pulse to judge the tape speed and outputs it to pins 18 and 19.
In the play and search modes, pressing the SP/LP switch does nothing.

6-11 Mode Switching

The 10-bit serial data transferred from the system control microprocessor (IC701) is used for switching the operation mode of servo control IC601. The serial data includes commands such as record, playback, slow, pause, search, fast forward, rewind, stop, cylinder on, etc. and an information on the tape speed. Fig 6-10 shows the composition of the serial data fransferred from the system control µP to the servo IC.

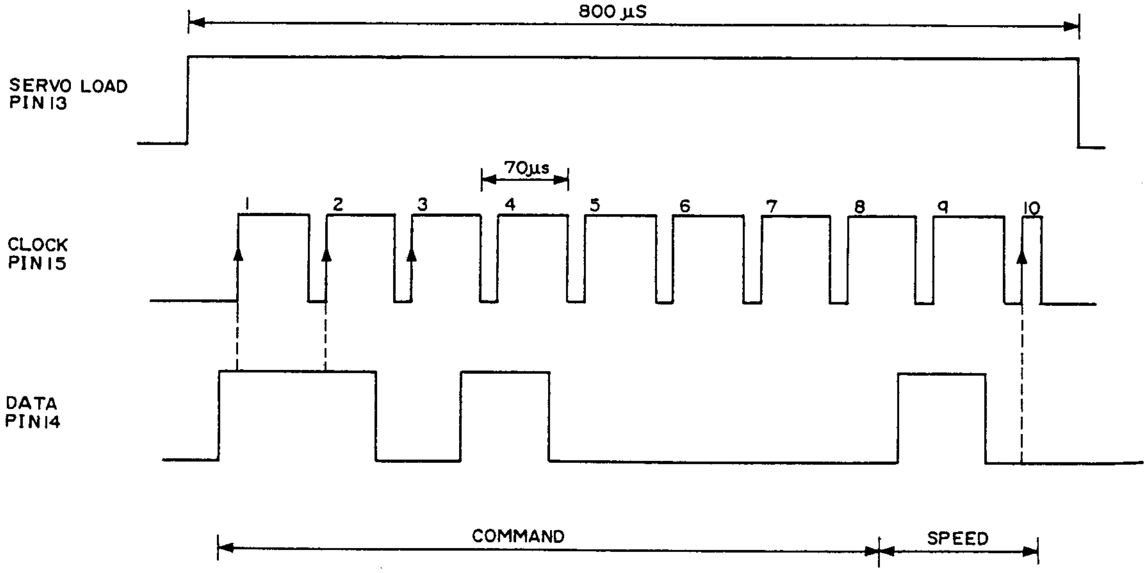


Fig. 6-10 Composition of Serial Data

6-12 Artificial V. Sync Generator

Fig. 6-11 shows the artificial vertical sync generator.
This generates an artificial V. sync pulse (V. DRIVE pulse) and inserts it into the video signal to compensate for dropout of the vertical sync signal that occurs during trick play. The generation timing of the artificial V. sync pulse for CH-1 is fixed 3H after the fall of the SW25Hz pulse. It can be varied for CH-2 by the externally attached variable resistor (RV1501: V. LOCK) to minimize the vertical fluctuations in the TV picture.
The artificial V. sync pulse is output from pin 17 of IC601 and is supplied to the video circuit to be added to the video signal.

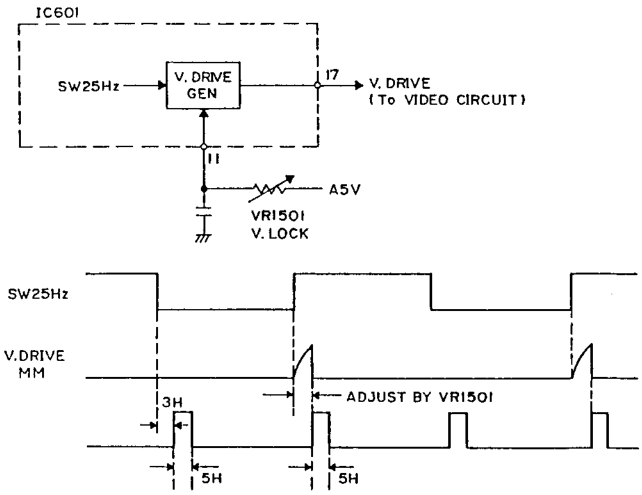


Fig. 6-11 Artificial V. Pulse Generator

6-13 Pin Functions of Servo IC601

Pin No.	I/O	Active Level	Abbreviation	Function
1	I	SINE WAVE	4.43MHz fsc	Receives a 4.43 MHz carrier signal from the luma/chroma circuit to generate clock pulses, REF25Hz and PWM signals.
2.				Connected to ground
3	O	PULSE	CYL-PHASE	Outputs a 1108kHz PWM signal to control the cylinder rotation phase. The duty ratio is varied according to the phase difference between the tach pulse and the reference signal.
4	O	PULSE	CYL-SPEED	Outputs a 1108kHz PWM signal to control cylinder speed. The duty ratio increases when the cylinder speed is slow and decreases when the cylinder speed is fast.
5	I	Hi/Lo	2-HEAD/$\overline{\text{4-HEAD}}$	Logic level at this pin must be switched according to video head configuration. To produce an appropriate head switching pulse SW25HZ suitable for the video head configuration and the tape speed, the logic level must be: Hi, for the normal 2 video head cylinder; Mid, for the orthogonal 4 head cylinder; Lo, for the double-azimuth 4 head cylinder.
6	I	PULSE	CYL-FG	Receives the cylinder FG signal for cylinder speed control.
7	I	PULSE	TACH PULSE	Receives the TACH signal as the comparison signal for cylinder phase control.
8	I	*	PHASE SHIFTER	Sets the phase of the SW25Hz signal to 6.5H lines before the start of the vertical sync signal.
9	O	PULSE	SW25Hz	Outputs SW25Hz signal for switching of video head switch, chroma phase rotation, etc.
10	O	PULSE	SW25A	Outputs the head switching pulse for the FM-audio heads. (Not used)
11	I	*	CH-2 PHASE	Adjusts the CH-2 phase of the artificial vertical sync signal.

Pin No.	I/O	Active Level	Abbreviation	Function
12	I	*	VD PHASE	Used to check the phase of the artificial vertical sync signal.
13	I	Hi	SERVO LOAD	Enables the IC to receive the servo operation code from the system control µP.
14	I	PULSE	DATA(M-SRV)	Receives the servo operation code.
15	I	PULSE	CLOCK(M-SRV)	Sync signal for data reception.
16	I	PULSE	SYNC	Receives the composite sync signal to synchronize the phase of the SW25Hz signal (cylinder phase) with the incoming vertical sync signal divided by two during recording.
17	O	PULSE	VD	Outputs the artificial vertical sync signal during search and still.
18	O	Hi	SP	Pin 18 outputs "Hi" when the detected tape speed is SP and pin 19 outputs "Hi" for LP. Used to switch the emphasis and deemphasis characteristics of the audio and video signals, etc. according to the tape speed.
19	O	Hi	LP	
21	I	PULSE	CFG	Receives the capstan FG signal as the comparison signal for capstan speed/phase control.
22	I	PULSE	CTL	Receives the playback control pulse as the comparison signal for capstan phase control.
23	I	Hi/Lo	INDEX(REC)	"Hi" sets the duty ratio of the output at pin 25 to 27.5% to record the index signal. "Lo" sets the duty ratio to 60% to record the control signal.
24	I	---	TRACKING	Shifts the phase of the REF25Hz signal for capstan phase control to make the playback FM envelope maximum.
25	O	PULSE	INDEX(PB)	Outputs "Hi" to starts the index function when the duty ratio of the playback control signal is 27.5%.
27	O	PULSE	CTL	Outputs the recording control (or index) pulse during record.
26				Not used
28				Pin for power supply
29	O	PULSE	CAPST-SPEED	Outputs a 1108kHz PWM signal to control the capstan speed. The duty ratio increases when the capstan (tape) speed is slow and decreases when the speed is fast.
30	O	PULSE	CAPST-PHASE	Outputs a 1108kHz PWM signal to control the capstan phase. The duty ratio of the PWM pulse is varied according to the phase difference between the conparison signal (CFG in record, CTL signal in playback) and REF25Hz.

*: These voltages are between 0V and 2.5V.

CHAPTER 7 TIMER

7-1 Functions of Timer μP

Table 7-1 Timer μP Function List

Clock	Present time display Present time set Present time update (even during power failure)
Instant Recording Timer	Start time, recording length, received channel set Recording execute, remaining time count Remaining time display
Timer Recording	Programme write (by local key and remote key) Programme read Programme clear Executes preset programme Controls timer recording with VPS code (for VPS model)
Channel Selection	Automatic tuning, Outputs tuning control pulse Channel up/down Direct channel selection External input selection
Driving flourescent display tube	VTR operation mode display Clock display Date display Programme indication Counter indication CH indication Tape remaining display
On-Screen Display (Not provided in the VT-M620E series)	Menu display Timer recording programme display VTR state display (operation mode, channel No., counter date, time)
Data Communications	System control μP Tuning μP (for FS), EAROM, VPS decoder
Remote Control Input	Receives remote control command
Key Input	Timer μP processing command Tuning processing command System control μP processing command
LED Indication	Operate LED indication
Power Failure	Power failure detection, Processing during power failure, Recovery processing
Miscellaneous	Audio output select, Picture control output, Tracking control output, Buzzer output, (VHF RF output switching)

Fig. 7-1 shows the composition of the key matrix switch of the unit. 11 x 3 key matrix switches are available. The key matrix circuit uses the segment (segments a - i) and grid (grids 1 - 2) drive pulses output from pins 64 - 54 of the timer μP as key scan signals. The segment drive signals are provided with a key scan period after the final grid has been activated. The outputs of the key matrix switches are applied to key matrix input pins 36 - 34. Among those key matrix swithes, the key matrix switches connected to MATRIX 0 pin 36 determine the function of the timer μP. Table 7-2 show the function of the timer μP determined by the key matrix of MATRIX 0. The key matrix switches connected to MATRIX 1 pin 35 and MATRIX 2 pin 34 are used for the user to input operation commands.

7-2 Command Input

Fig. 7-2 and Fig. 7-3 show the composition of timer circuit.
The operator's commands are input to the timer μP via either the key matrix circuit or IR receiver circuit.

Key matrix input

The basic commands such as play, record, fast forward, rewind, stop, operate, eject, etc. are transferred as follows.

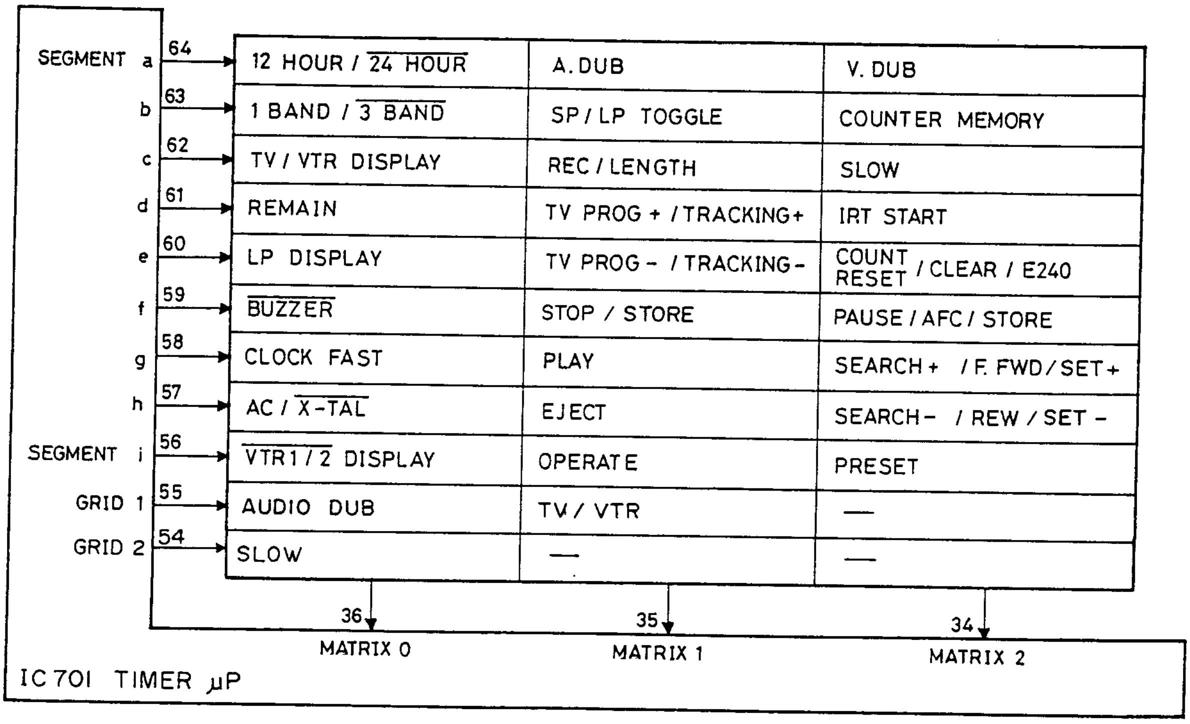
1. The timer μP transfers a data

assigned to the command to the system control µP.

2. The system control µP sets the circuitry and mechanism to the mode corresponding to the data.
3. The system control µP transfers a status data to the timer µP to show the mode of operation in the display tube.

IR remote control system

Fig. 7-4 shows the waveforms of the infrared ray signal transmitted from the remote control hand unit.
The infrared ray signal is pulse-position-modulated (PPM) on the 38 kHz carrier. The timer µP receives the infrared ray signal transmitted from the remote controller through an infrared receiver module. The infrared receiver module receives through a photodiode and makes the output amplitude constant. Then the infrared receiver module removes the 38 kHz carrier component to detect the PPM signal and applies it to pin 24 of the timer µP. The timer µP decodes the PPM signal, converts it to a digital data and detects the command issued. Table 7-3 shows the remote codes.



		36 MATRIX 0	35 MATRIX 1	34 MATRIX 2
SEGMENT a	64	12 HOUR / $\overline{\text{24 HOUR}}$	A.DUB	V.DUB
b	63	1 BAND / $\overline{\text{3 BAND}}$	SP / LP TOGGLE	COUNTER MEMORY
c	62	TV / VTR DISPLAY	REC / LENGTH	SLOW
d	61	REMAIN	TV PROG + / TRACKING+	IRT START
e	60	LP DISPLAY	TV PROG - / TRACKING-	COUNT RESET / CLEAR / E240
f	59	$\overline{\text{BUZZER}}$	STOP / STORE	PAUSE / AFC / STORE
g	58	CLOCK FAST	PLAY	SEARCH + / F. FWD / SET+
h	57	AC / $\overline{\text{X-TAL}}$	EJECT	SEARCH - / REW / SET -
SEGMENT i	56	$\overline{\text{VTR1 / 2}}$ DISPLAY	OPERATE	PRESET
GRID 1	55	AUDIO DUB	TV / VTR	—
GRID 2	54	SLOW	—	—

IC701 TIMER µP

Fig. 7-1 Function of Key Matrix Switch

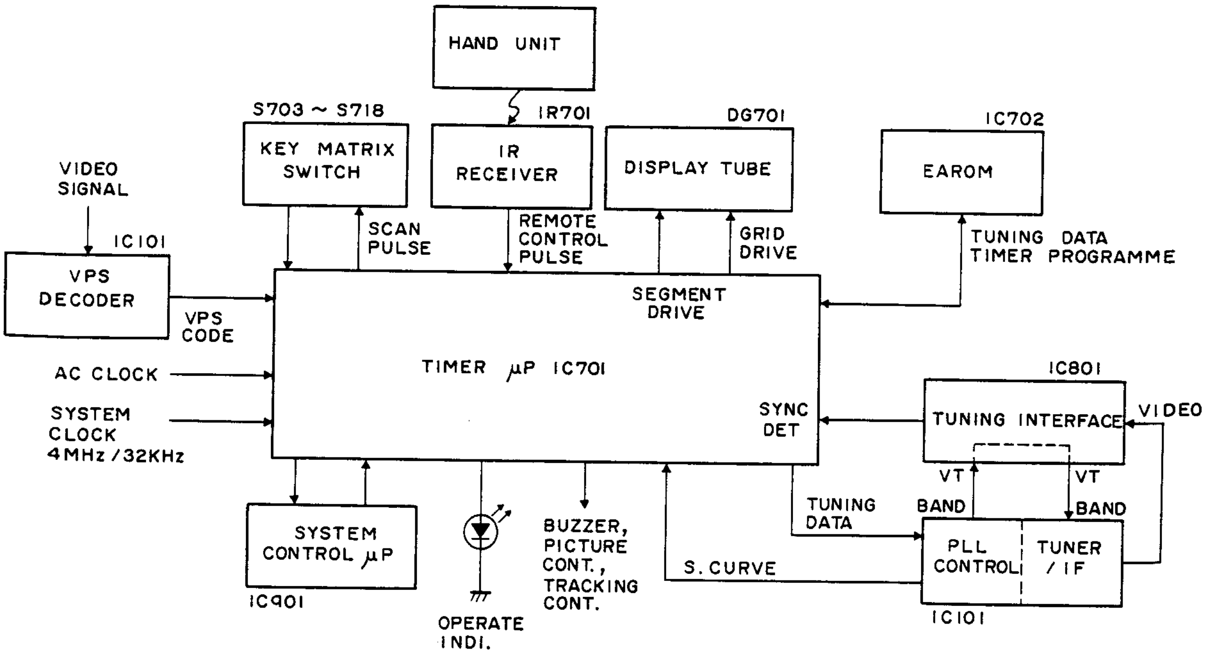

HAND UNIT
S703 ~ S718
KEY MATRIX SWITCH
IR701
IR RECEIVER
DG701
DISPLAY TUBE
IC702
EAROM
VIDEO SIGNAL
IC101
VPS DECODER
SCAN PULSE
REMOTE CONTROL PULSE
GRID DRIVE
TUNING DATA
TIMER PROGRAMME
SEGMENT DRIVE
VPS CODE
AC CLOCK
SYSTEM CLOCK 4MHz/32KHz
TIMER µP IC701
IC801
TUNING INTERFACE
VIDEO
SYNC DET
VT
VT
BAND
BAND
TUNING DATA
PLL CONTROL
TUNER / IF
IC101
S. CURVE
SYSTEM CONTROL µP
IC901
BUZZER, PICTURE CONT., TRACKING CONT.
OPERATE INDI.

Fig. 7-2 Timer Circuit (for FS Tuning)

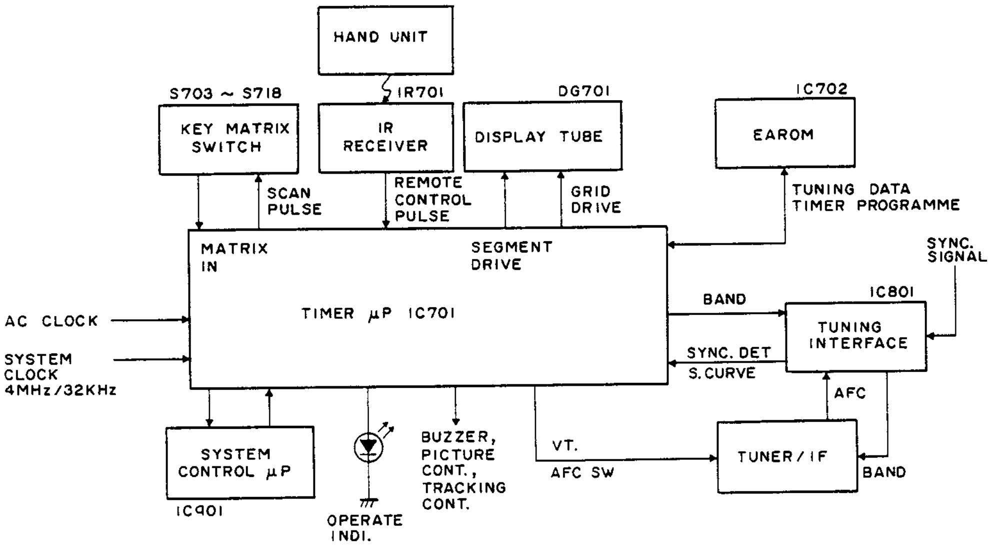

HAND UNIT
S703 ~ S718
KEY MATRIX SWITCH
IR701
IR RECEIVER
DG701
DISPLAY TUBE
IC702
EAROM
SCAN PULSE
REMOTE CONTROL PULSE
GRID DRIVE
TUNING DATA
TIMER PROGRAMME
MATRIX IN
SEGMENT DRIVE
SYNC. SIGNAL
AC CLOCK
TIMER µP IC701
BAND
IC801
TUNING INTERFACE
SYSTEM CLOCK 4MHz/32KHz
SYNC. DET
S. CURVE
AFC
SYSTEM CONTROL µP
IC901
BUZZER, PICTURE CONT., TRACKING CONT.
VT.
AFC SW
TUNER/IF
BAND
OPERATE INDI.

Fig. 7-3 Timer Circuit (for VS Tuning)

Table 7-2 Function of MATRIX

Matrix	Abbreviation	Network	Function
a	12H/24H	ON	AM,PM 12-hour display
		OFF	24-hour display
b	1 BAND/3 BAND	ON	1 band(VS)/ 3 bands(FS)
		OFF	3 bands(VS)/ 3 bands(FS)
c	TV/VTR DISPLAY	ON	Displays TV/VTR
		OFF	Does not display TV/VTR
d	REMAIN	ON	Without tape remaining and E240 display
		OFF	Provides tape remaining and E240 display
e	LP DISPLAy	ON	Provides LP speed and SP/LP display
		OFF	Without LP speed and SP/LP display
f	BUZZER	ON	Without buzzer output
		OFF	Provides buzzer output
g	CLOCK FAST	ON	Counts 1 second as 1 minute
		OFF	Normal action
h	AC/X TAL	ON	Uses mains frequency for the clock
		OFF	Uses crystal oscillator frequency for the clock
i	VTR 1/2 DISPLY	ON	Without VTR 1/VTR 2 display. Receives the remote control command transmitted only by the hand unit whose CH1/CH2 switch is set to CH1.
		OFF	Displays VTR 1/VTR 2. Display of VTR 1/ VTR 2 can be switched by operating the F.FWD input key. While VTR 2 is displayed, the timer µP accepts the remote control command transmitted from the remote control unit with its VTR 1/VTR 2 switch is set to VTR2.
j	AUDIO DUB	ON	Provides audio dub function
		OFF	Without audio dub function.
k	SLOW	ON	Provides slow function
		OFF	Without slow function.

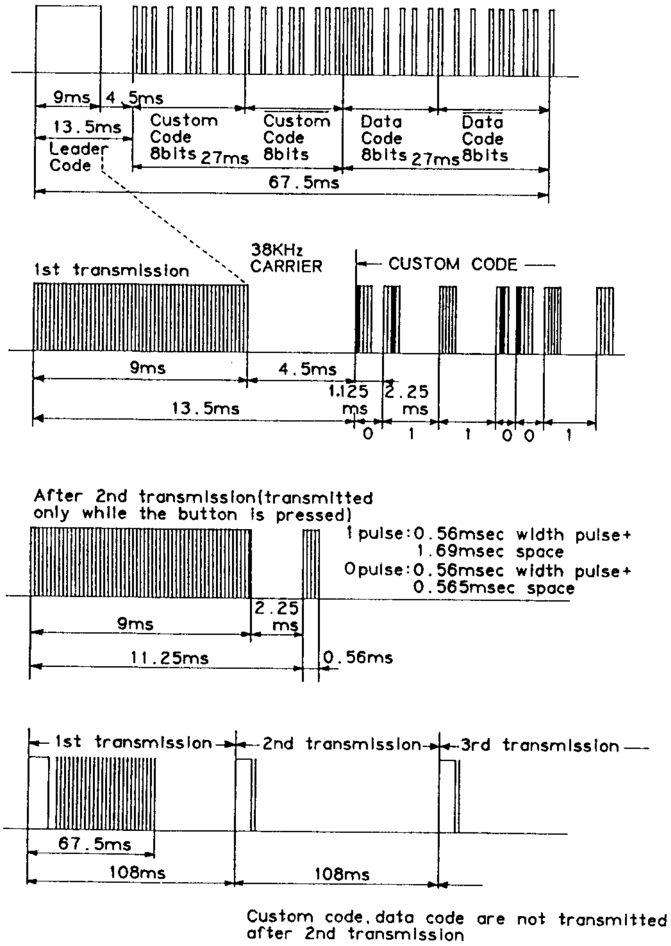

9ms
4.5ms
13.5ms
Leader Code
Custom Code 8bits
27ms
Custom Code 8bits
Data Code 8bits
27ms
Data Code 8bits
67.5ms
1st transmission
38KHz CARRIER
CUSTOM CODE
9ms
4.5ms
1.125 ms
2.25 ms
13.5ms
0 1 1 0 0 1
After 2nd transmission(transmitted only while the button is pressed)
1 pulse:0.56msec width pulse+ 1.69msec space
0pulse:0.56msec width pulse+ 0.565msec space
2.25 ms
9ms
11.25ms
0.56ms
1st transmission
2nd transmission
3rd transmission
67.5ms
108ms
108ms
Custom code, data code are not transmitted after 2nd transmission

Fig. 7-4 Infrared Transmission Signal

7-3 Flourescent Display Tube

The VTR uses an LED and a flourescent display tube to inform the operator whether or not the VTR is operating properly. The LED and display tube are driven by the timer μP.

Fig. 7-5 shows the internal connection of the display tube. Fig. 7-6 shows the location of the segments and grids. Fig. 7-7 shows the display drive circuit.

To drive the display tube dynamically, the timer μP outputs 11 grid drive pulses (GRID 1 - GRID 11) with a different phase and 9 segment drive pulses (Sa - Si).

The amplitude of the grid and segment drive pulses is determined by the DC voltage at Vcc pin 1 and V.DISP pin 25, and the positive peak is + 5 VDC and the negative peak is - 28 VDC.

The timer μP receives the data to be displayed from the internal circuits and system control μP and switches the logic level of the segment drive pulses in synchronization with the grid pulses.

When a power failure occurs, all displays go off to reduce the consumption of backup power supplied from backup capacitor C701.

When the operate switch is turned off, only the clock is displayed.

INTERNAL CONNECTION

S\G	11	10	9	8	7	6	5	4	3	2	1
a	OPE	OO	a	a	a	a			a	a	IRT
b	◁◁	REC	b	b	b	b			b	b	REMAIN
c	◁◁	VTR	c	c	c	c			c	c	DATE
d	I:	LP	d	d	d	d			d	d	COUNTER
e	:I		e	e	e	e	MON		e	e	
f	▷▷		f	f	f	f	FRI	TUE	f	f	
g	▷▷		g	g	g	g	ON	SAT	g	g	
h	AM		INDEX		:	THU	OFF	CH	WED	SC	
i	PM		SP	VPS	PROG	SUN	M	◷	WKL	E240	

Fig. 7-5 Internal Connection of Display Tube

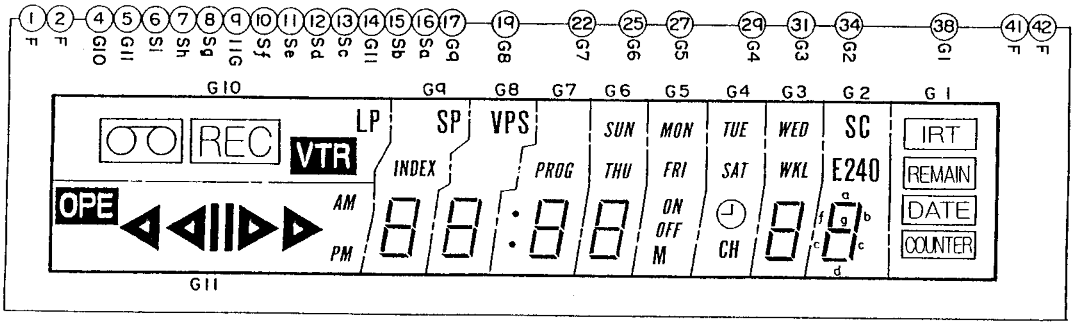

1
2
4
5
6
7
8
9
10
11
12
13
14
15
16
17
19
22
25
27
29
31
34
38
41
42
F
F
G10
G11
G9
G8
G7
G6
G5
G4
G3
G2
G1
OO
REC
VTR
LP
SP
VPS
INDEX
PROG
SUN
THU
MON
FRI
TUE
SAT
WED
WKL
SC
E240
IRT
REMAIN
DATE
COUNTER
OPE
AM
PM
ON
OFF
M
CH
a
b
c
d
f
g

Fig. 7-6 Location of Segments and Grids

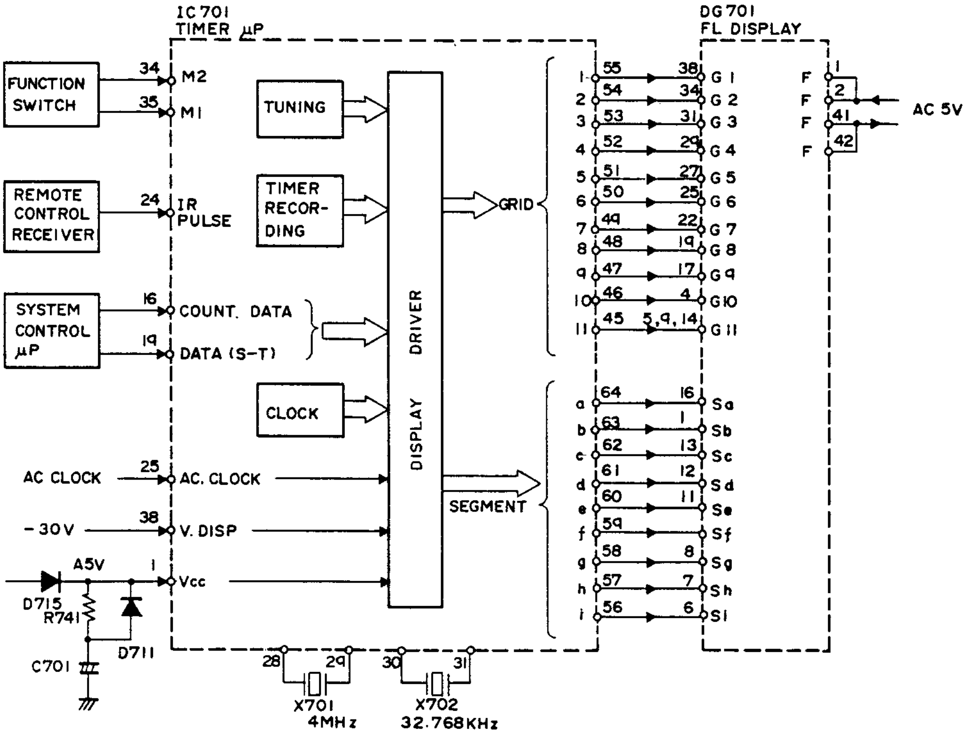

IC701
TIMER μP
DG701
FL DISPLAY
FUNCTION SWITCH
34
M2
35
M1
REMOTE CONTROL RECEIVER
24
IR PULSE
SYSTEM CONTROL μP
16
COUNT. DATA
19
DATA (S-T)
TUNING
TIMER RECOR-DING
CLOCK
DISPLAY DRIVER
GRID
SEGMENT
AC CLOCK
25
AC. CLOCK
-30V
38
V. DISP
A5V
1
Vcc
D715
R741
C701
D711
28
29
30
31
X701
4MHz
X702
32.768KHz
G1
G2
G3
G4
G5
G6
G7
G8
G9
G10
G11
Sa
Sb
Sc
Sd
Se
Sf
Sg
Sh
Si
F
AC 5V

Fig. 7-7 Display Drive Circuit

Table 7-3 Codes Transmitted from Hand Unit

CUSTOM CODE	DATA CODE							
	LOWER DIGIT UPPER DIGIT	0	1	2	3	4	5	6	7
60	0	SLOW TRACK+	SLOW TRACK-	SLOW SPEED+	SLOW SPEED-	DIGIT 8	DIGIT 9		
	1	FRAME ADV.-	SLOW	FAST	FWD SRCH	PLAY	CH 1/ CH 2	VTR/TV	POWER ON/OFF
	2	ART	DIGI. MEMO.	P IN P	P IN P POS. SHIFT	POWER ON	POWER OFF	MULTI PICTURE	SEEK
	3	SP/LP	NORM/ CATV	PAUSE ON	PAUSE OFF	LINE/ TUNER	IRT LENGTH	IRT START	ALC TGL
	4	PROG.	COUNT. RESET	DISPLY	TIMER REC	COUNTER MEMORY	INDEX	COUNTER/ REMAIN	REPEAT

CUSTOM CODE	DATA CODE								
	LOWER DIGIT UPPER DIGIT	8	9	10	11	12	13	14	15
60	0		F.FWD	REW	STOP	DIGIT 0	DIGIT 1	DIGIT 2	DIGIT 3
	1	CH DOWN	CH UP	PAUSE/ STILL		DIGIT 4	DIGIT 5	DIGIT 6	DIGIT 7
	2	DIGI- TAL +	DIGI- TAL -						
	3	STEREO /MONO	EJECT	V.DUB	HELP	PRESET	TRACKING RESET		PICTURE CONTRL RESET

CUSTOM CODE	DATA CODE			
	LOWER DIGIT / UPPER DIGIT	1	4	0 - 15
61	1		REC	
	4	LOCK		
64	0 - 5			TIMER RECORDING PROGRAMMES/ PRESENT TIME

7-4 Clock/Timer/IRT Control

The timer µP is responsible for controlling the timer and instant recording timer. When the data necessary for timer recording has been entered, and the clock reaches the programmed time with the VTR power off, recording starts automatically.

The timer can preset 8 TV programmes in a year including weekly or daily programmes.

The IRT enables timer recording of one programme with a simplifed programme setting procedure.

Clock control

Fig. 7-8 shows the clock control circuit. The power input, pin 1, of the timer µP receives the A5V power source from the power supply circuit normally and from a large-capacitance capacitor C701 during a power failure. When a power failure occurs, the capacitor maintains the present time for approx. 60 (15: for the VT-M620E series) minutes.

The timer µP always monitors the mains frequency input via pin 25 to detect the mains frequency (50 Hz or 60 Hz) and power failures. When the mains period is less than 18.3 ms, the timer µP judges that the mains frequency is 60 Hz, and when the period is between 18.3 and 50 ms, it judges the frequency to be 50 Hz, and when the period is 50 ms or more, it detects a power failure.

In this unit, as the matrix switch between SEGMENT h pin 57 and MATRIX 0 pin 36 is disconnected, the timer µP uses the 32 kHz clock pulse generated by X702 as the reference clock signal to update the clock. In the unit which uses the AC clock as the reference clock signal, the timer µP divides the AC clock at pin 25 to produce the reference clock signal. The devision ratio of the AC clock is switched automatically according to that the AC clock is 60 Hz or 50 Hz.

When detecting a power failure, the timer µP performs the following 2 sequences:

1. Opens all output ports to reduce the power consumption of the timer µP during the power failure. Doing this, the indicator and display tube go off.
2. Switches the system clock frequency of the timer µP to reduce the power consumption of the timer µP (and to update the time). In the normal state, it selects the 4 MHz clock produced by the crystal connected between pins 28 and 29. In case of a power failure, it selects the 32.768 kHz clock produced by the crystal connected between pins 30 and 31.

Timer recording

The timer µP monitors the present time output from the clock counter section, timer recording programmes in the programme list of the timer µP and the

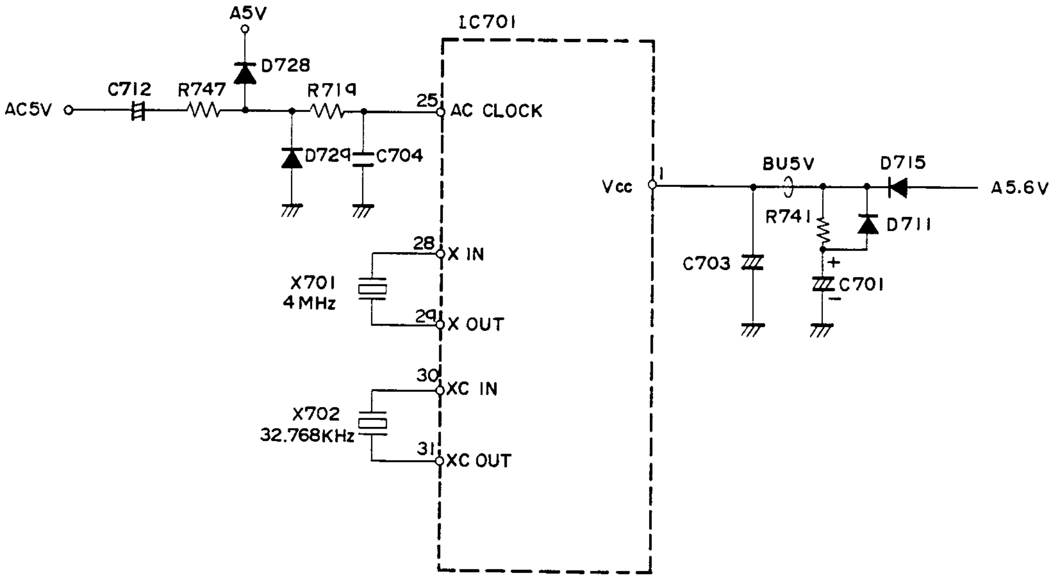


Fig. 7-8 Clock Control Circuit

operation mode informed from the system control µP, and issues the "TIME ON" command to the system control µP. When a programme has been entered, a cassette with its safety tab has been loaded, and the power switch of the VTR is turned off, the timer µP sets the VTR to the timer standby mode and lights the "timer symbol" indicator in the display tube.
If a cassette without its safety tab is loaded, the system control µP ejects the cassette immediately and the timer µP flashes the "timer symbol" in the display tube to warn the operator.
When the clock reaches a recording start time, the timer µP transmits the "TIME ON" code to the system control µP. When the system control µP receives this code, it transmits the "TIME ON" code to the timer µP to match the operation mode of both µPs, and starts the timer recording. At the same time, the timer µP selects the channel that has been reserved for timer recording.
The programme list of the timer µP stores the start time, stop time, channel number to be recorded for timer recording programmes and the IRT programme.
When a programme for timer recording is set, it is also stored in the EAROM, and when the recording finishes or is cleared, it is erased. The data stored in the EAROM is transferred to the programme list in the timer µP when power is restored after a power failure has occurred.
The required data for timer recording is input by operating the keys of PROGRAMME, 10-key, PROGRAMME MEMORY, CORRECT and etc. on the remote control hand unit.

IRT Control

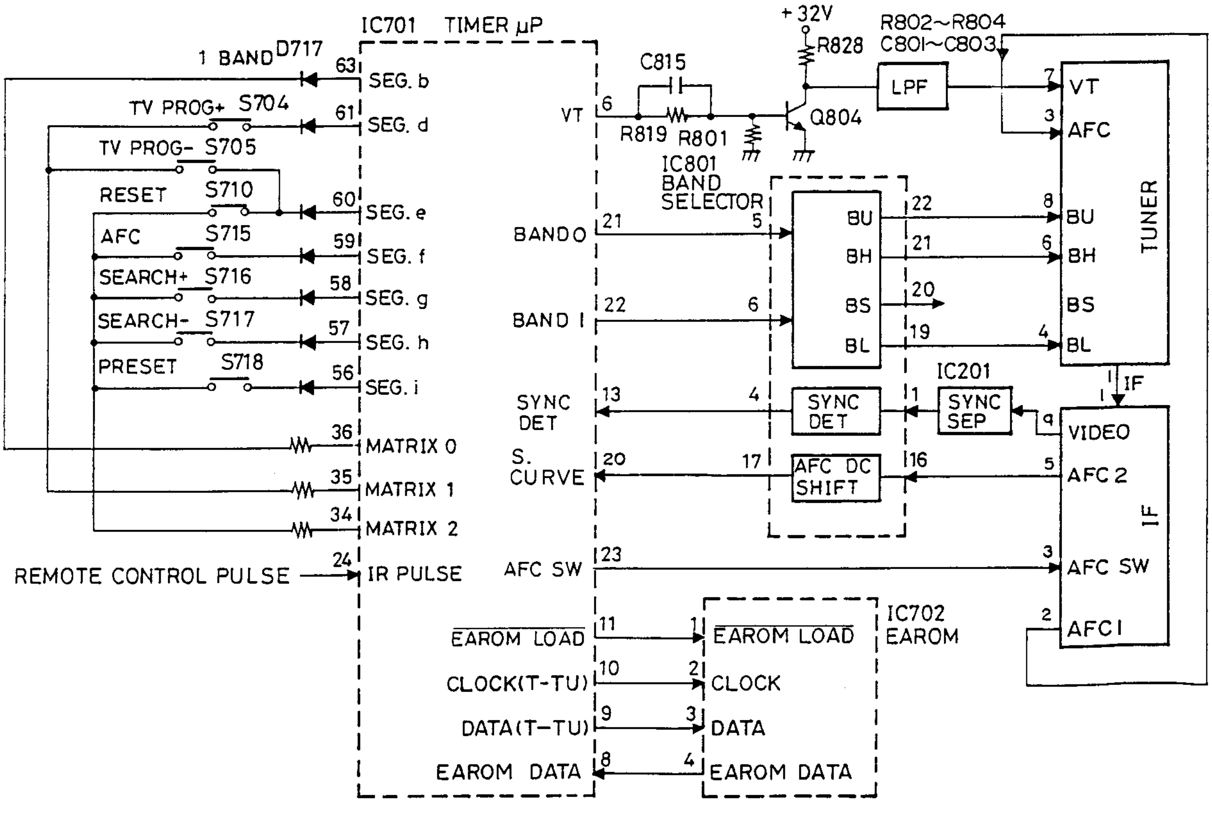
Instant recording (IRT) is timer recording that can be programmed by a simplified procedure. The recording start time can be set within a maximum of 24 hours from the present time in 1-minute steps. The recording end time is determined automatically by selecting one of 6 recording lengths (30, 60, 90, 120, 180, 240 minutes). When a recording length is selected without setting the recording start time, the present time is set automatically as the start time and recording starts immediately.
To release instant recording, set the recording length to display "0:00" and then wait for 8 seconds. The start time and length can be set only when the VTR power is turned on. The remaining recording time is indicated in the display tube during instant recording. When the display reaches "0:00", the VTR power is turned off.
The data for the instant recording timer is input by the keys of CHANNEL UP, CHANNEL DOWN, IRT START and IRT LENGTH located on the front panel.

7-5 VS (Voltage Synthesizer) Tuning Control

Fig. 7-9 shows the VS tuning control circuit. The VS tuning system is used in models UK, SW, SA, GK, DS, DH, AU, etc. The VS tuning control circuit consists of the timer µP, EAROM, band selector, tuner and IF circuits.

7-5-1 Channel Select Operation

When changing the channel is commanded by



IC701 TIMER µP
1 BAND D717
63 SEG. b
TV PROG+ S704
61 SEG. d
TV PROG- S705
RESET S710
60 SEG. e
AFC S715
59 SEG. f
SEARCH+ S716
58 SEG. g
SEARCH- S717
57 SEG. h
PRESET S718
56 SEG. i
36 MATRIX 0
35 MATRIX 1
34 MATRIX 2
REMOTE CONTROL PULSE
24 IR PULSE
VT 6
BAND 0 21
BAND 1 22
SYNC DET 13
S. CURVE 20
AFC SW 23
EAROM LOAD 11
CLOCK(T-TU) 10
DATA(T-TU) 9
EAROM DATA 8
C815
R819
R801
+32V
R828
Q804
R802~R804
C801~C803
LPF
IC801 BAND SELECTOR
BU
BH
BS
BL
5
6
4
17
22
21
20
19
1
16
SYNC DET
AFC DC SHIFT
IC201
SYNC SEP
9
TUNER
7 VT
3 AFC
8 BU
6 BH
BS
4 BL
IF
VIDEO
5 AFC 2
3 AFC SW
2 AFC I
IF
IC702 EAROM
1 EAROM LOAD
2 CLOCK
3 DATA
4 EAROM DATA

Fig. 7-9 VS Tuning Control Circuit

the key matrix switch S704 TV PROG+, S705 TV PROG- or the remote control transmitter, the channel number is designated to the timer µP and the timer µP sends a mute command to the system control µP via DATA(T-S) pin 18 and outputs "Hi" via pin 23 (AFC SW) to disable the AFC operation of the IF circuit. Then the timer µP reads the tuning data of the designated channel from the EAROM. The timer µP uses the read tuning data to output a PWM signal that controls the tuning voltage and a 2-bit band code that designates the band to be selected, via pins 6, 21 and 22.

The band selector IC801 decodes the band code to create a band select signal BU, BH, BS, or BL, and supplies it to the tuner. The tuning control PWM signal is inverted by Q804 and smoothed by the LPF to be a tuning control DC voltage. The tuning control DC voltage is applied to the tuning circuit in the tuner. This causes the tuner to select the designated channel. After a designated channel is selected, the timer µP makes the output at AFC SW pin 23 "Lo" and enables the AFC operation of the IF circuit.

When the AFC OFF information is present in the tuning data read from the EAROM, the timer µP continues to output "Hi" via AFC SW pin 23 . When the TV programme up/down is commanded, if the tuning voltage is zero, the timer µP reads the tuning data of the next higher (lower) channel again and uses this new data to create the tuning voltage control PWM signal and the 2-bit band code.

7-5-2 Channel Preset Operation

Broadcast stations can be preset in the preset mode. When S718 (PRESET) is pressed once, the timer µP enters the preset mode, and when it is pressed again, the timer µP returns to the normal mode. To preset a broadcast station into the EAROM, the channel number where the broadcast station is to be preset must be designated first. When a channel is designated by S704/S705 (TV PROG+/TV PROG-) or the remote control transmitter, the timer µP reads the tuning data of the designated channel from the EAROM to form the tuning control PWM signal and band select code and outputs them to select a broadcast. The timer µP also displays the channel number and AFC state in the fluorescent display tube.

When S716 (SEARCH+) is pressed in the preset mode, the timer µP enters the UP SEARCH mode. The timer µP sends a mute command to the system control µP via DATA(T-S) pin 18 and set AFC SW pin 23 to "Hi". The audio signal is muted and the AFC operation stops. The timer µP also changes the duty ratio of the tuning control PWM signal at pin 6 and raises the tuning DC voltage.

When a broadcast is received, as the tuning voltage is raised higher, the IF circuit supplies a video signal tuned to luminance processor IC201. The sync separator in IC201 separates the sync signal and applies it to the sync detector in the band select IC IC801. The sync detector outputs "Hi" via pin 4 when the sync signal is present at pin 1 and applies it to SYNC DET pin 13 of the timer µP. The timer µP acknowledges that a broadcast is received when "Hi" is present at SYNC DET pin 13.

The IF circuit monitors the picture IF frequency/local oscillator frequency and outputs the AFC control signal via AFC2 pin 5 (AFC1 pin 2) so that these frequencies become the nominal values. The nominal voltage of the AFC control signal is approx. 6.5 V. If the local oscillator frequency is lower than the nominal value, the AFC control voltage is raised, and when it is higher than the nominal frequency, the AFC control voltage is lowered.
The AFC DC SHIFT stage in band selector IC801 decreases the AFC control voltage by approx. 3.5 V DC and applies its output to S CURVE pin 20 of the timer µP. S CURVE accepts "Hi" when the local oscillator frequency is lower than the nominal frequency and "Lo" when it is higher than the nominal frequency; the logic level applied to S CURVE changes (Hi to Lo) near the nominal frequency.
When a broadcast is received (SYNC DET is "Hi") in the UP SEARCH mode and the level of the S CURVE signal is changed from "Hi" to "Lo", the timer µP stops the UP SEARCH operation. At this time tuning data consisting of a 13-bit tuning voltage, 2-bit band code, and 1-bit AFC data is stored in the memory of the timer µP. The timer µP writes the updated data to the EAROM. When AFC S715 is pressed in the preset mode to change the AFC state, the timer µP also writes the tuning data (including the AFC data) to the EAROM. If an active broadcast station is not received in the band being searched, the timer µP changes the band according to the loop, VHF L band → VHF H band → UHF band → VHF L band, and sets the tuning voltage to minimum and then resumes the up search operation.
When SEARCH- S717 is pressed in the preset mode, the tuning voltage decreases in reverse to perform the down search operation.

7-6 FS Tuning Control

The FS (Frequency Synthesis) tuning system is used in the models CT and VPS.

Fig 7-10 shows the FS tuning control circuit.
The FS tuning system comprises the timer µP IC701, EAROM IC702, tuning interface IC801, PLL frequency controller IC101 and tuner/IF block. The timer µP receives tuning control commands via key matrix switches provided on the front panel or IR remote receiver and controls above mentioned ICs.
This unit utilizes a varactor tuner and regulates the tuning voltage applied to the varactor diodes to tune to broadcast stations.

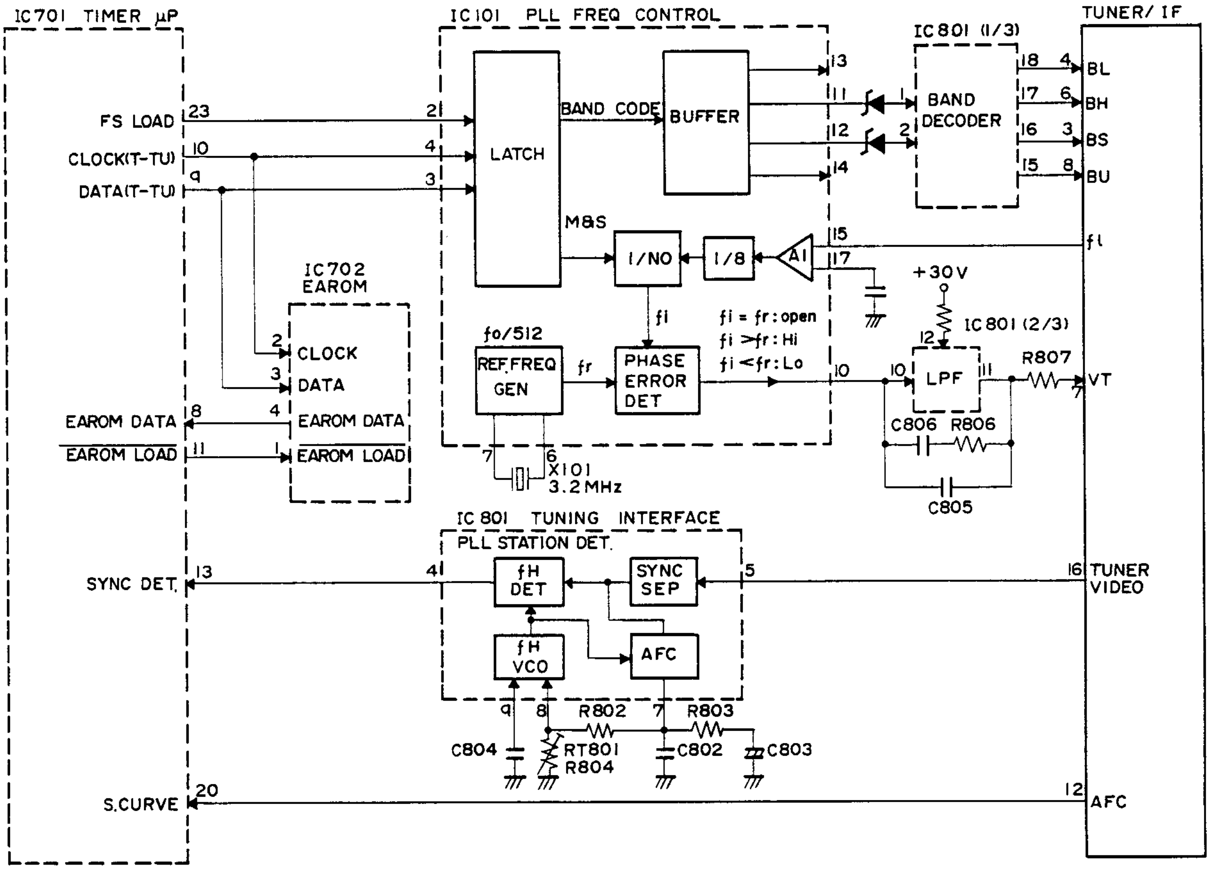

IC701 TIMER µP
FS LOAD
23
CLOCK(T-TU)
10
DATA(T-TU)
9
EAROM DATA
8
EAROM LOAD
11
SYNC DET.
13
S.CURVE
20
IC101 PLL FREQ CONTROL
2
4
3
LATCH
BAND CODE
BUFFER
M&S
1/NO
1/8
A1
fi
fi = fr : open
fi > fr : Hi
fi < fr : Lo
fo/512
REF.FREQ GEN
fr
PHASE ERROR DET
13
11
12
14
15
17
10
7
6
X101
3.2MHz
IC702
EAROM
CLOCK
DATA
EAROM DATA
EAROM LOAD
IC801 (1/3)
BAND DECODER
18
17
16
15
4
6
3
8
+30V
IC801 (2/3)
LPF
R807
C806
R806
C805
TUNER/IF
BL
BH
BS
BU
fL
VT
16
TUNER VIDEO
12
AFC
IC801 TUNING INTERFACE
PLL STATION DET.
fH DET
SYNC SEP
fH VCO
AFC
5
9
8
R802
7
R803
C804
RT801
R804
C802
C803

Fig. 7-10 FS Tuning Control Circuit

Band Switching

Band switching is performed by the band decoder stage of tuning interface IC801(1/3). IC801(1/3) receives two-bit bandswitching data from pins 11 and 12 of PLL IC101 via two DC level shift Zener diodes.
IC101 receives 19-bit serial digital data including information on the band and division ratio from the timer µP via 3 data bus lines, and stores it in the latch stage. The buffer stage accepts the 4-bit band code from the latch stage and converts it to a 4-bit parallel band code and then outputs it to band decoder IC801 (1/3) via pins 11 and 12. In this unit, since the number of the broadcast bands that can be received is 4 at most, only the lower two bits are used to select the band. The band decoder convert the 2-bit parallel band code to the band switching signal in the form of 4 individual outputs. The bandswitching signal is applied to the tuner via from pins 15 through 18 of IC801.

Tuning

The PLL frequenccy controller IC101 utilizes the pulse swallowing technique for generation of the tuning voltage. The error correction signal at pin 10 of IC101 is supplied to pin 10 of IC801(2/3). An amplifier in IC801(2/3), capacitors C805, C806 and resistor R806 form a lowpass filter and generate a DC tuning voltage (VT). The tuning voltage determines the oscillation frequency of the local oscillator and the local oscillator frequency (fL) is fed back from the tuner/IF circuit to PLL frequency controller IC101 via pin 15. The local oscillator frequency (fL) is then applied to the divider circuit in IC101. The divider circuit is composed of a 1/8 divider and a programmable divider.
The division ratio (No) is determined by the division data transferred from the timer µP via data transfer lines FS LOAD pin 23, CLOCK(T-TU) pin 10 and DATA(T-TU) pin 9. Fig. 7-11 shows the composition of the tuning data. The division data is composed of the 10-bit serial main division ratio (M) and 5-bit serial swallowing division ratio (S), and total divion ratio (No) and the local oscillator (fL) frequency are determined by the following equations.

$$No = 8 \cdot (32M + N)$$
$$32 \leq M \leq 1024$$
$$0 \leq S \leq 31$$
$$fL = 50\ (32M + S)\ \text{kHz}$$

Within IC101, a 3.2 MHz clock signal is generated by the reference frequency generator and the 3.2 MHz crystal connected between pins 6 and 7 and is divided by 640 to produce a 5 kHz

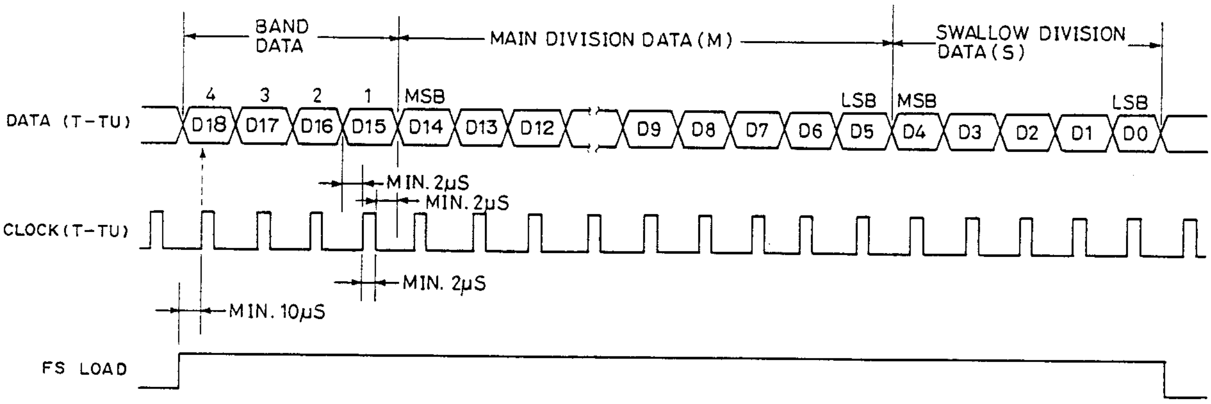


Fig. 7-11 Composition of Tuning Data

reference signal (fr). The local oscillator frequency (fi) divided down by the divider circuit is compared with this reference signal (fr) and generates a error correction signal. The error correction signal corrects the tuning voltage produced by the LPF stage in IC801 (2/3) and thus adjusts the frequency of the local oscillator to the optimum value.

Station Detection

IC801(3/3) is provide with a station detector having a PLL loop. The oscillation frequency of the fH VCO stage is set by the RC time constant attached to pins 8 and 9. RT801 is adjusted to set the oscillation frequency to 15.625 kHz. A composite video signal is applied to the sync separator stage of the station detector via pin 5 from the tuner/IF circuit. The sync separator extracts the sync signal and sends it to the fH phase detector stage. The phase detector compares the phases of the horizontal sync signal and the fh VCO oscillator frequency and judges that the sync signal is present when both phases are in phase. If the sync is present, "Hi" is output via pin 4 of IC801(3/3) to SYNC DET pin 13 of the timer μP. By this, the timer μP recognizes a TV station is correctly received.

The timer μp uses the station detector output to perform auto fine tuning.

Auto Fine Tuning

In the channel preset mode, when search presetting or direct presetting is commanded, auto fine tuning is performed to set the local oscillator frequency to the optimum value.

In the channel preset mode, when the direct presetting of the 50th real channel to a position where tuning data has not been preset is commanded, the timer μP performs auto fine tuning as follows.

1. When a position where no data has been preset is selected to preset a real channel, the timer μP send a command to mute audio to the system control μP.

2. The timer μP transmits the band code and division data (M: 463, S: 27) to the PLL frequency controller to make the controller tune to the 50th real channel. (picture frequency: 703.25 MHz, local oscillator frequency: 742.15 MHz)

3. The timer μP monitors the logic level at SYNC DET pin 13 to judge whether or not a TV station is received. If a station is receved and the logic level at SYNC DET is "Hi", the timer μP monitors S.CURVE at pin 20. S.CURVE is derived from the AFC control voltage and represents whether tuning is correct or not.
Fig. 7-12 shows the frequency response of S.CURVE and SYNC DET.

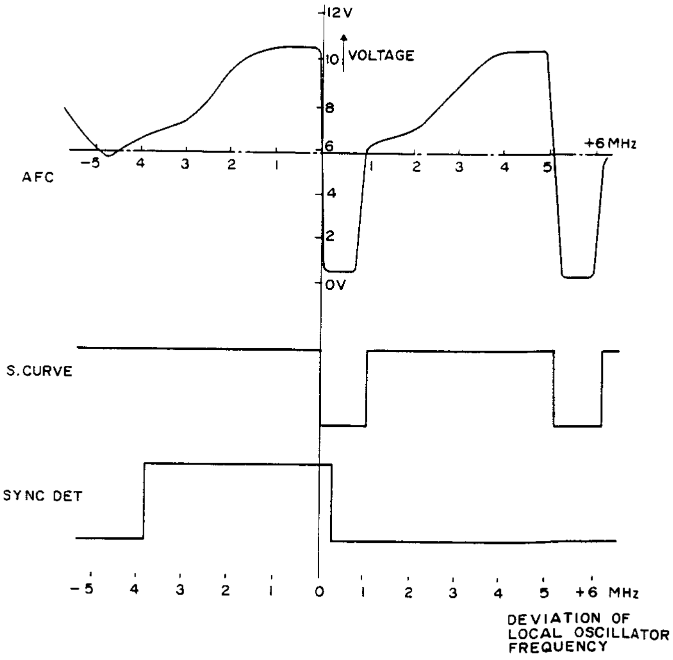


Fig. 7-12 Frequency Response of S.CURVE and SYNC DET

4. If S.CURVE is "Lo", the timer µP increment the local oscillator frequency in 50 KHz steps to search the optimum tuning point.

5. When S.CURVE changes from "Lo" to "Hi", the timer µP fixes division number No to fix the local oscillator frequency. Thus the optimum tuning point is found.

6. By pressing the STORE button, the tuning data (real channel number and fine tuning data that is the difference between the nominal division number and the active division number) are stored in the EAROM.
The timer µP sends a command that stops muting to the system control µP, and sound goes on informing the user that a real channel has been preset to the position.

7. In step 3, if "Hi" is not detected at SYNC DET, the timer µP sweeps the local oscillator frequency ranging from -2.5 MHz to +3.5 MHz and monitors SYNC DET. Doing this, if "Hi" is detected at SYNC DET, the timer µP performs step 4.
If "Hi" is not detected at SYNC DET, the timer µP set division number No to nominal number and then completes the auto fine tuning.

8. In step 4, if S.CURVE is "Hi", the timer µP increments the local oscillator frequency in 100 kHz steps until S.CURVE falls to "Lo". And if S.CURVE falls to "Lo", the timer µP performs step 4.

9. In steps 4 and 8, if "Hi" or "Lo" is not found within ± 3.5 MHz, the timer µP sets the division number to the nominal value and completes the auto fine tuning.

Manual Fine Tuning

The timer µP allows manual fine tuning after a channel has been preset to the position in the preset mode.
Manual fine tuning is achieved by pressing the +search or -search button in the preset mode.
When the +search or -search button is pressed, the timer µP changes the division number to vary the local oscillator frequency in 50 kHz steps within ± 3.5 MHz on the basis of the nominal frequency.
When the store button is pressed, the timer µP stores the fine tuning data to the EAROM.

Eliminating Preset Channels

When the clear button is pressed to eliminate an unwanted channel preset in a position in the preset mode, the timer data of the channel is preset, the timer µP erases the tuning data preset in the position and mutes audio to inform the user that the position has been cleared.
When the channel (position) to be viewed is switched, the timer µP reads the data from the EAROM, creates tuning data (division ratio, band code) and transfers it to the PLL frequency control IC.

Table 7-4 Address Allocation in EAROM

	Bit address	
Word address	15 14 13 12 11 10 9	8 7 6 5 4 3 2 1 0
0	Real channel number for position 1	Fine tuning data for position 1
1	Real channel number for position 2	Fine tuning data for position 2
67	Real channel number for position 68	Fine tuning data for position 68
68	Real channel number for position 69	Fine tuning data for position 69
69	Real channel number for position 70 (AUX)	
80 - 83	Timer recording programme for programme 1	
84 - 87	Timer recording programme for programme 2	
104 - 107	Timer recording programme for programme 7	
108 - 111	Timer recording programme for programme 8	

EAROM

EAROM is the abbreviation for Electrically Alterable ROM. It is an electrically erasable and programmable ROM composed of 2048 bits (16 bits x 128 words). The timer μP can write, erase and read data to/in/from the EAROM by transmitting commands to the EAROM from DATA(T-TU) pin 9 to DATA pin 3 of the EAROM. The EAROM becomes active when "Lo" is applied to pin 1 ($\overline{\text{EARM LOAD}}$). Data is transferred from the timer μP to the EAROM through the DATA(T-TU) line as well as the commands and these are read from the EAROM through the EAROM DATA line, synchronized with the clock pulses on the CLOCK (T-TU) line.

The EAROM also stores 8 programmes for timer recording. Table 7-4 shows the address allocation in the EAROM.

7-7 Tracking and Picture Controls

In the former model, a variable resistor was used to control the tracking, but this unit uses the timer μP for tracking control.
TRACKING pin 5 outputs a 4 Vp-p tracking control PWM signal to the servo circuit. Fig. 7-13 shows the tracking control circuit. The tracking control PWM signal output from pin 5 is inverted by QR615 and then applied to the lowpass filter consisting of R672 and C637, where the PWM signal is smoothed to a tracking control DC voltage. The tracking control DC voltage varies the charging current flowing through Q614 and charges C603. When the tracking control switches TRACKING +/- on the front panel or on the remote control unit are operated, the duty ratio of the PWM signal at pin 5 varies in 64 steps and the delay time of the tracking momostable multiviblator varies ranging from 10 ms to 40 ms.
PICTURE CONT. pin 4 also outputs a 4 Vp-p picture control PWM signal in 64 steps to the luminance circuit in the playback and still playback modes.

7-8 VPS Decoder

Fig 7-14 shows the VPS decoder. VPS decoder IC101 accepts a 1 Vp-p video signal at pin 13 from the tuner/IF block via a switch consisting of Q1508 and Q1581. The sync separator stage in the decoder IC separates the sync signal from the video signal and outputs it to the data line slicer stage, phase detector stage and pin 5. The data line slicer stage extracts the VPS bi-phase signal and supplies it to phase detector and data line decoder. The phase detector develops a clock frequency control signal by comparing the sync signal and bi-phase signal with the generated clock signal, and supplies it to the clock pulse generator via pin 9, lowpass filter, pin 12 and amplifier A1, and sets the clock pulse frequency to 5 MHz.
Recieving the data line data (bi-phase signal) and clock signal, the data line decoder detects the VPS code, and stores it in memory. When the VPS code is requested by the timer μP at a rate of once per second, the data line decoder stage outputs the VPS code from memory (4.5 Vp-p) synchronized with the clock pulses supplied at pin 2 (4.5 Vp-p).
The timer μP controls the timer recording using the VPS code.

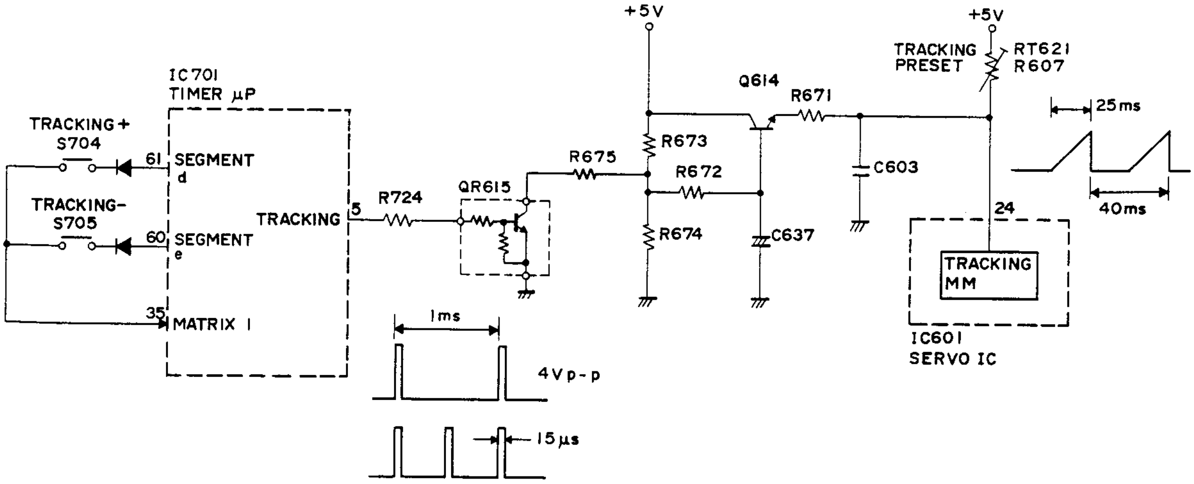


Fig. 7-13 Tracking Control Circuit

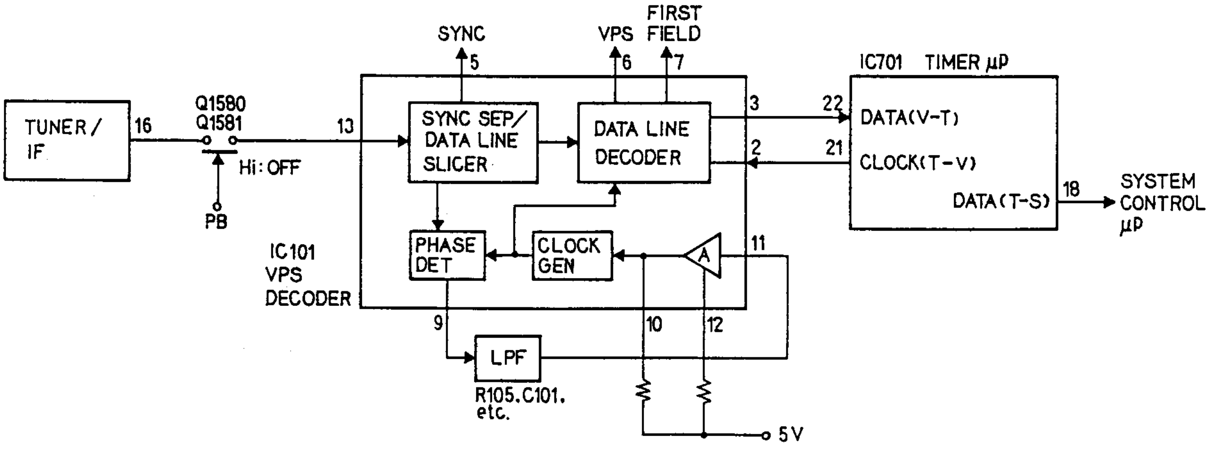

SYNC
5
VPS
6
FIRST FIELD
7
TUNER/ IF
16
Q1580
Q1581
Hi: OFF
PB
13
SYNC SEP/ DATA LINE SLICER
DATA LINE DECODER
PHASE DET
CLOCK GEN
A
IC101 VPS DECODER
3
2
11
9
10
12
LPF
R105,C101, etc.
5V
IC701 TIMER µP
22
21
DATA(V-T)
CLOCK(T-V)
DATA(T-S)
18
SYSTEM CONTROL µP

Fig. 7-14 VPS Decoder

7-9 Pin Functions of Timer µP M50957-663 (VS Tuning: UK, AU, DH, DS, GK, S, SA, SW)

Pin No.	I/O	Active Level	Abbreviation	Function
2 3	O O	Hi Hi	CH1 (L CH) CH2 (R CH)	Select audio signals. Logic state can be switched by the CH1/CH2 input key provided on the remote control hand unit. (Not used in this unit)
4	O	Pulse	PICTURE CONT.	Outputs a PWM signal, which is converted to a picture control DC voltage and then applied to the luminance processing IC to vary the
5	O	Pulse	TRACKING	Outputs a 4 Vp-p PWM wave to conrol the tracking. The duty cycle of the PWM wave can be varied by the tracking up/down switches in 15 steps.
6	O	Pulse	VT	Outputs pulses which regulate the local oscillator frequency in the tuner.
7	O	Pulse	BUZZER	Outputs a 4 kHz buzzer drive signal when a operation command is entered or the VTR mode is changed.
8	I	Pulse	EAROM DATA	Receives the tuning data and the timer recording programmes which have been written to the EAROM.
9	O	Pulse	DATA (T-TU)	Outputs the band code which designate a band and the tuning data which designate a local frequency to the PLL IC. Outputs the skip and AFT on/off data, the timer recording programmes to the EAROM.
10	O	Pulse	CLOCK (T-TU)	Sync signal for transfer of data between the timer µP and the EAROM, and from the timer µP to the PLL IC via the DATA (T-Tu) and EAROM DATA lines.
11	O	Hi	EAROM LOAD	Activates the data communication function between the timer µP and the EAROM.
23	O	Hi	FS LOAD	Enables the PLL IC in the tuner to receive data.

Pin No.	I/O	Active Level	Abbreviation	Function
*6	O	Pulse	VT	Outputs a PWM signal which regulates the local oscillator frequency in the tuner.
*8	I	Pulse	EAROM DATA	Receives the tuning data and the timer recording programmes which have been written to the EAROM.
*9	O	Pulse	DATA (T-TU)	Outputs the band code, the tuning data which designate a tuning voltage, AFT on/off data and timer recording programmes to the EAROM.
*10	O	Pulse	CLOCK (TI-R)	Sync signal for transfer of data between the timer µP and EAROM, and from the timer µP to the PLL IC.
*11	O	Hi	EAROM LOAD	Activates the data communication function between the timer µP and the EAROM.
*22	O	Hi	BAND 2	Outputs a two-bit band code via these pins to select the band.
*21	O	HI	BAND 1	
13	I	Hi	SYNC.DET	Monitors presence/absence of the sync signal to judge whether a channel is tuned or not. When the sync signal is not present for 8 minutes, the timer µP send a power shut off command to the system control µP.
14	O	Pulse	DIG.DATA	Outputs data for digital video processing to a digital video processing µP.
15	O	Pulse	DIG.CLOCK	Outputs a clock pulse to send digital video processing data.
12	O	Pulse	DATA2 (T-S)	Outputs data for on-screen display such as the present time, counter reading, channel number, timer recording programmes, etc.
16	I	Pulse	COUNT DATA	Receives data to display the counter reading and remaining time.
17	I	Pulse	CLOCK (S-T)	Sync signal for the communication between the timer µP and system control µP.
18	O	Pulse	DATA (T-S)	Outputs operation commands.
19	I	Pulse	DATA (S-T)	Receives codes which represent modes of operation.
20	I	Lo	S CURVE	Monitors the AFT output produced in the IF circuit, to find the optimum tuning state.
21	O	Pulse	CLOCK (T-V)	Works as the sync signal to receive VPS data.
22	I	Pulse	DATA (V-T)	Receives data which controls timer recording.
23	O	Hi	AFC SW	Enables the AFT operation in the IF circuit.
24	I	Pulse	IR PULSE	Receives the remote control signal.
25	I	Pulse	AC CLOCK	Updates the clock and detects power failures.
27	I	Lo	$\overline{\text{RESET}}$	Initializes the timer µP.
28	I	AC	X IN	Generates the system clock of 4 MHz.
29	O	AC	X OUT	
30	I	AC	XC IN	Generates a reference clock signal of 32 kHz. It is used to update the clock in the models that do not use the mains frequency as the reference signal or during power failures.
31	O	AC	XC OUT	

Pin No.	I/O	Active Level	Abbreviation	Function
34	I	Hi	MATRIX 2	Key matrix input ports
35	I	Hi	MATRIX 1	
36	I	Hi	MATRIX 0	
37	I	Lo	$\overline{\text{BILINGUAL}}$	Sets "Hi" or "Lo" to pins 2 and 3 simultaneously when "Hi" is applied to this pin by operating the CH1/CH2 input key on the remote control hand unit. It is possible to set "Hi" to one or both of pins 2 and 3 with the remote control hand unit when this pin is connected to ground.
39	O	Hi	OPERATE LED	Lights the operate LED.
40	O	Hi	EXP LOAD	Activates an expander µP.
41	O	Hi	PRESET	Outputs "Hi" during preset mode, to control the monitor TV.
42	O	Hi	PAL/SECAM	Outputs "Hi" when the number of the channel selected is 40 or more to discriminate between the PAL and SECAM systems.
43	O	Hi	GRID 14	Output grid drive pulses.
55	O	Hi	GRID 1	
56	O	Hi	SEGMENT (i)	Output segment drive pulses and key scan pulses.
64	O	Hi	SEGMENT (a)	
1	I	Hi	Vcc	Pins for power supply and ground.
26		Lo	GND	
32		Lo	Vss	
38	I	Lo	V_{DISP}	

Pin Functions of Timer µP M50957-663 (FS Tuning: CT/VPS)

Pin No.	I/O	Active Level	Abbreviation	Function
21	O	Pulse	CLOCK (T-V)	Outputs a clock pulse to the VPS decoder necessary to receive VPS data.
22	I	Pulse	DATA (V-T)	Accepts VPS data which control timer recording.
23	O	Hi	FS LOAD	Enables the FS tuning control µP to receive tuning data which designate the band and local frequency.

CHAPTER 8 POWER SUPPLY

Fig. 8-1 shows the regulator circuit. When the nominal AC voltage is applied to the primary winding of power transformer T850, AC voltages 16 V, 9 V, 30 V and 5 V are generated at the secondary windings, W1, W2, W3 and W4 respectively. D851 rectifies 16 V AC to produce unregulated A16 V (20.5 V DC). A16 V is regulated by the 12 V regulator in IC851 to A12 V. RECT 2 consisting of D861-D864 rectifies AC 9 V to produce DC 9 V which is regulated by the 5 V regulator to 5.3 V DC. D857 produces the control voltage which activates the 12 V regulator in IC851. When the Operate switch on the VTR or remote control hand unit is pressed or a timer programmed recording starts, the system control µP receives a power on command from the timer µP and outputs "Hi" via pin 6 (POWER CONT.). This "Hi" voltage is applied to pin 2 of regulator IC851 via R851. When "Hi" is applied to pin 2, IC851 turns S1 on, activates the 5 V regulator and supplies 12 V DC and 5.3 V DC to each circuit.

Table 8-1 shows the distination of the power supplies.

A16 V is used to drive the capstan and cylinder motors.
A12 V is independent of the operate switch and is supplied to the tuner/IF, tuning IC, RF converter, loading motor, etc. 12 V which is dependent on the operate switch is mainly used in the audio processing circuit.
The 5 V DC power source is the main power source of each circuit.
A9 V is regulated to 5.6/5 V DC in the VS or FS tuning circuit (Voltage/Frequency Synthesizer tuning circuit). 5.6/5 V DC are used to activate the timer, system control and tuning circuits (and VPS decoder µP).
AC30 V is rectified in the system control section to +30 V DC and -30 V DC.
-30 V DC is applied to the timer µP and is used to create the grid and segment pulses which drive the fluorescent display tube. +30 V DC is used to produce a tuning control voltage in the tuning circuit.
AC 5 V is used to heat the heater of the fluorescent display tube. AC 5 V is also used as a reference pulse in the timer circuit to updates the clock.

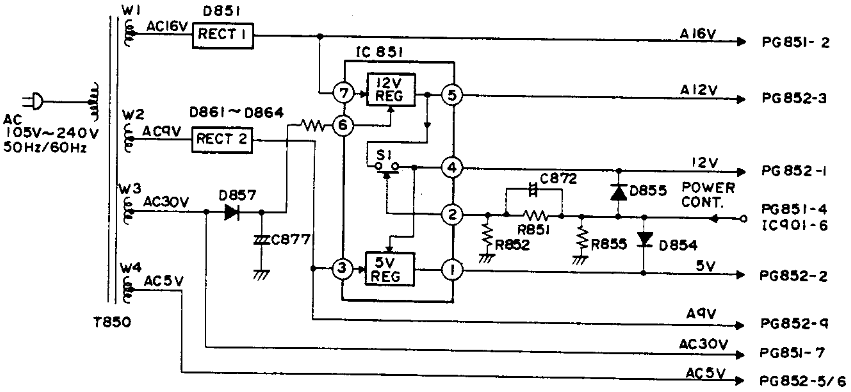


Fig. 8-1 Regulator Circuit

Table 8-1 Destination of Power supplies

Source	Regulator/Rectifier	Destination
PG851-2 A16 V	Q623 (Servo) Q621 (SerVO)	Cylinder motor driver (IC1651) Capstan motor driver (IC01)
PG852-3 A12 V	(Jack) (Sys.con) (FS/VS)	Tuner/IF, RF converter Loading motor driver (IC902), End lamp (D141) Tuning IC (IC801)
PG852-1 12 V	(Jack) (Audio)	Audio input switch (IC2503), Video buffer amps,etc. Audio processor (IC401)
PG852-2 5 V		Each circuit as main power supply
PG852-9 A9 V	IC802 (FS/VS) A5.6 V	D2533 (Jack) 5 V VPS IC101 D802 (FS/VS) 5 V FS/VS, PLL IC101 D911 (Sys.con) 5 V IC901, IC902, IC981, Mecha state switch D714 (Timer) 5 V IR701, IC702 D715 (Timer) 5 V IC701, IC703
PG851-7 AC 30 V	D907,Q902(Sys.con) -30 V D908 (Sys.con) +30 V	ZD702, ZD701 (Timer) IC701, DG701 Tuning voltage (F/S,V/S) IC801
PG852-5/6 AC 5 V	(Timer)	Heater of FL tube

CHAPTER 9 Z-CHASSIS MECHANISM

9-1. General description

Though this mechanism is a chassis for use in a table-type VTR which can record and play back an ordinary VHS cassette, it is different from the previous mechanism and has the following features.

(1) Using the motive power of the capstan motor for front loading.
capstan motor were independent, but in this model, the FL motor is omitted and the motive power of the capstan motor is used.

(2) Half loading
During fast forward and rewind, the tape is half loaded and the index signal recorded on the control track is picked up by the control head, thus enabling the index search function.

(3) DD capstan motor
Providing the DD capstan motor which was previously only used in portable VTRs allows the chassis to handle various functions such as high-speed search, etc.

(4) A slim chassis
The height of the chassis in the previous Y-mechanism VTR is 90 mm, but the height of new Z-mechanism VTR is only 76 mm, thus allowing the height of the VTR to be reduced to 81 mm. (The height of Y-mechanism VTR is 95 mm.)

9-2. Major components locations (top view) and operations

(1) Supply reel disk(Fig. 9-1)
This has a gear on its circumference to transmit motive power. A slip mechanism is not provided inside. The tab which is linked with the reel hub has the shape of an arrow inclined in both directions, differing from one inclined in one direction.

(2) Tension band
This operates using the same principle as in previous mechanisms. To change the tape tension, the hooking position of the spring which pulls the tension arm must be changed.
To change the angle of the tape wound round the tension pole, loosen the screw holding the tension band retaining plate and change the plate position to adjust the angle. This makes it possible to change the gain of tension servo.

(3) Guide pole
This control the height of the tape after the tension pole. Use a box driver and turn it to adjust the height of the guide pole. The compression spring which was used conventionally has been omitted.

(4) FE head
This works in the same way as in the conventional mechanism. The installation method has been changed from the screw type to the insert and fix type.

(5) Impedance roller
This is molded from polyacetal resin, the same as in the conventional mechanism, and reduces jitter. Since this is a precision-made roller, take care not to scratch or lubricate it. If the roller is lubricated, the following troubles may occur.

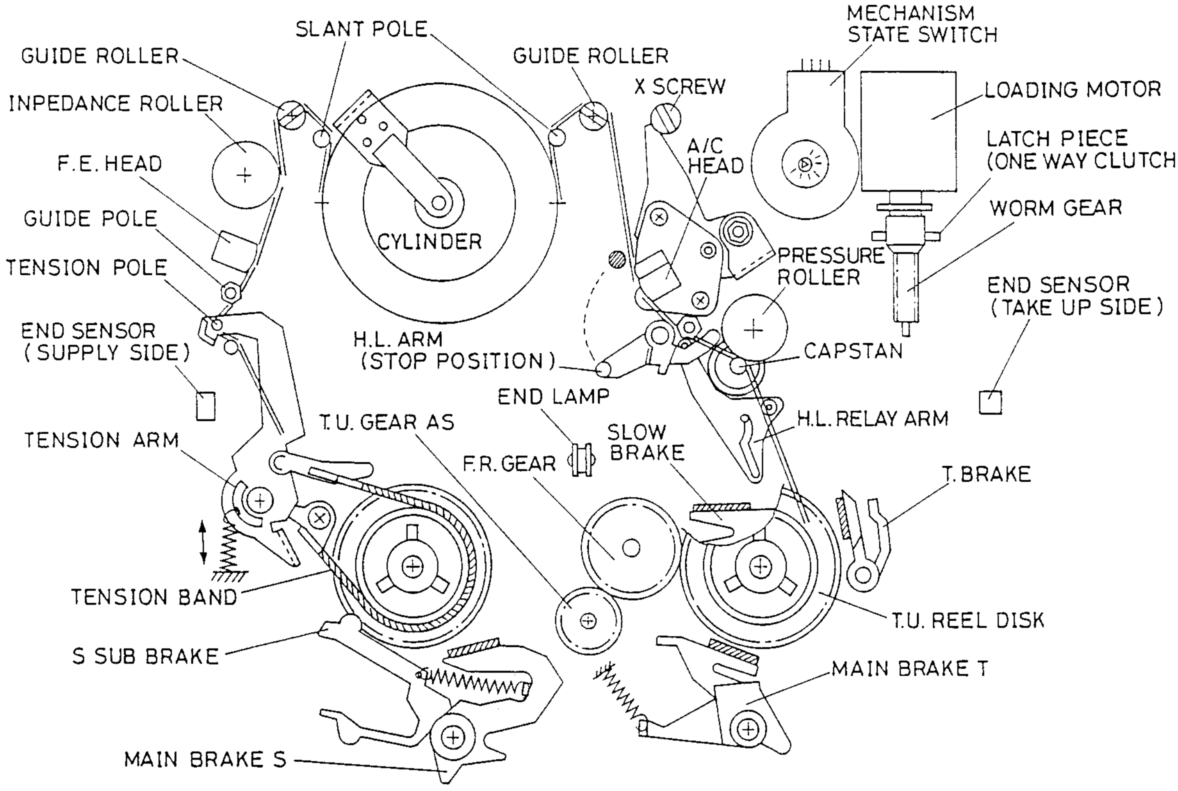

SLANT POLE
GUIDE ROLLER
INPEDANCE ROLLER
F.E. HEAD
GUIDE POLE
TENSION POLE
END SENSOR (SUPPLY SIDE)
TENSION ARM
TENSION BAND
S SUB BRAKE
MAIN BRAKE S
GUIDE ROLLER
X SCREW
A/C HEAD
CYLINDER
MECHANISM STATE SWITCH
LOADING MOTOR
LATCH PIECE (ONE WAY CLUTCH)
WORM GEAR
PRESSURE ROLLER
END SENSOR (TAKE UP SIDE)
CAPSTAN
H.L. ARM (STOP POSITION)
END LAMP
T.U. GEAR AS
SLOW BRAKE
F.R. GEAR
H.L. RELAY ARM
T. BRAKE
T.U. REEL DISK
MAIN BRAKE T

Fig. 9-1 Main Chassis (Top View)

(1) Oil could leak and adhere to the tape.
(2) Rotation could suffer due to the viscosity of the oil.

(6) Guide rollers

These have the same construction as conventional guide rollers and the roller section is molded from polyacetal resin.
Adjust the height by loosening the lock screw at the bottom of the roller using a hexagonal wrench (Allen key) and then by inserting a flat head screwdriver into the groove in the top of the roller.

(7) Cylinder assembly

Since the upper cylinder is fixed by connectors, assemble the new upper cylinder after wiping the connector pins with freon or alcohol. Mount the upper cylinder so that the arrow mark on the pedestal of the lower cylinder and the trickplay head on the upper cylinder are aligned. The construction of other sections is the same as in the conventional cylinder assembly.

(8) X-value adjustment screw (X-SCREW)

Though this screw is positioned between the A/C head and capstan shaft in previous VTRs, it is provided beside the take-up arm stopper in this model. When the X-screw is turned clockwise, the A/C head is brought near the capstan shaft, allowing the X-value to be increased.

(9) A/C head

Actually this head comprises (1) the audio erase head, (2) audio head and (3) control head.
The audio erase head erases the previously recorded audio signal in the audio dub mode.
The audio head records and plays back an audio signal (linear audio head).
The control head records and plays back a 30-Hz signal obtained by separating the sync signal from the video signal and dividing it by two, thus controlling the tape speed during playback.

(10) H.L. (Half Loading) arm

This arm is used to access the "index search and address search system" that is a new feature of VHS VTRs. During fast forward and rewind, this arm pulls the tape out of the cassette to set it to the half loading state so it is in contact with the A/C head.
The A/C head reads the control signals with the duty of 60% (equivalent to a "0" digital signal) and 27.5% (equivalent to "1") recorded on the control track, thus allowing index search and address search.
Though the H.L. arm is set to the same position during fast forward/rewind and play, the pin on the arm is not in contact with the tape during play.

(11) Capstan

Using a DD capstan motor allows various functions such as high-speed search, etc. The CFG pulse frequency is 1515 Hz in the SP mode and 757 Hz in LP.
During slow motion, the slow brake is pressed against the capstan to brake the capstan flywheel, thus reducing the apparent inertia efficiently to simplify control. Oil-less metal is used for the upper bearing and a ball bearing for the lower bearing to withstand high-speed rotation and improve reliability.

(12) Pressure roller

Since one ball bearing is used at the center, adjusting the perpendicularity of the pressure roller is not necessary. Its structure is the same as the conventional roller.

(13) Take-up reel disk

This has a ferrite ring at the bottom to detect rotation and gear on its circumference to transmit motive power. A slip mechanism is not provided inside. The T brake, pressed against the gears on the external circumference, not only prevents the tape from being pulled out from the take-up reel disk during loading but also applies reverse torque to the disk during reverse search to prevent tape slack.

(14) T brake

This is pressed against the take-up reel disk to apply weak braking to the disk. During loading, this brake is pressed against the take-up reel disk to brake the disk so that the tape is not pulled out from the disk.
During reverse search, the T brake is also pressed against the take-up reel disk to prevent tape slack.

(15) Take-up gear assembly and FR gear

The torque of the capstan motor is transmitted to this take-up gear assembly via the slip mechanism. The FR gear is engaged with the take-up gear assembly and swings to the left and right according to the direction of rotation of the take-up gear assembly to drive both reel disks.

(16) Slow brake

During slow motion, this is pressed against the DD capstan flywheel so it is easier for the capstan to stop instantaneously.
This slow brake is provided to turn the capstan motor on and off and time the tape transport and head, thus providing a clear slow motion picture.

(17) S sub-brake

This is pressed against the supply reel disk above the tension band and applies weak torque to the disk during loading and fast forward to prevent slack tape.

(18) Main brakes S and T

These are pressed against both reel disks to brake them. Since these brakes use a directional braking system, the difference between braking in the clockwise and counterclockwise directions must be sufficient when the brake shoes are pressed against the reel disks to stop the tape without causing

any slack.
To do this, it is important to drive the brakes with the same timing and maintain the friction at the brake contact surfaces at more than the specified value.

9-3. Major components locations (side view) and operations

Fig. 9-2 is a side view showing the torque transmission route from the capstan flywheel.
The torque from the capstan motor is transmitted to the take-up pulley via the flat belt. The take-up pulley has a gear at its top with which the change gear and F.L. change gear are engaged to transmit motive power to both reel disks and the front loading mechanism.
The change gear transmits power from the take-up pulley to the take-up gear assembly via the slip mechanism.
When the change gear is set to the "Hi" position, torque is transmitted to the slip mechanism of the take-up gear assembly. The torque from the slip mechanism is passed through the next FR gear (swing gear) and is transmitted to the supply and take-up reel disks to be used as take-up or unloading torque.
When the change gear is set to the "Lo" position, the gear of the take-up gear assembly which does not slip is engaged with the change gear. Therefore, strong torque is transmitted to both reel disks via the FR gear and fast forward or rewinding is performed.
That is, the change gear is moved up and down by the motive power of the loading motor and changes the torque between (1) weak torque for play and loading and (2) strong torque for fast forward and rewind to transmit it.
The F.L. change gear is also engaged with the take-up pulley. This F.L. change gear is also set to the "Hi" or "Lo" position by the motive power of the loading motor.
When the F.L. change gear is set to the "Hi" position, the torque of the capstan motor transmitted to the take-up pulley does not go to the F.L. change gear and therefore the front loading operation is not performed. That is, this indicates that the front loading operation is complete. When the F.L. change gear is set to the "Lo" position, the torque transmitted to the take-up pulley from the capstan motor through the square belt is applied to the relay gear via the F.L. change gear. The worm gear is engaged with this relay gear to transmit torque to the front loading mechanism. The worm gear drives the front loading mechanism to make it perform the front loading operation. The F.L. change gear and change gear are combined as shown in the table below.

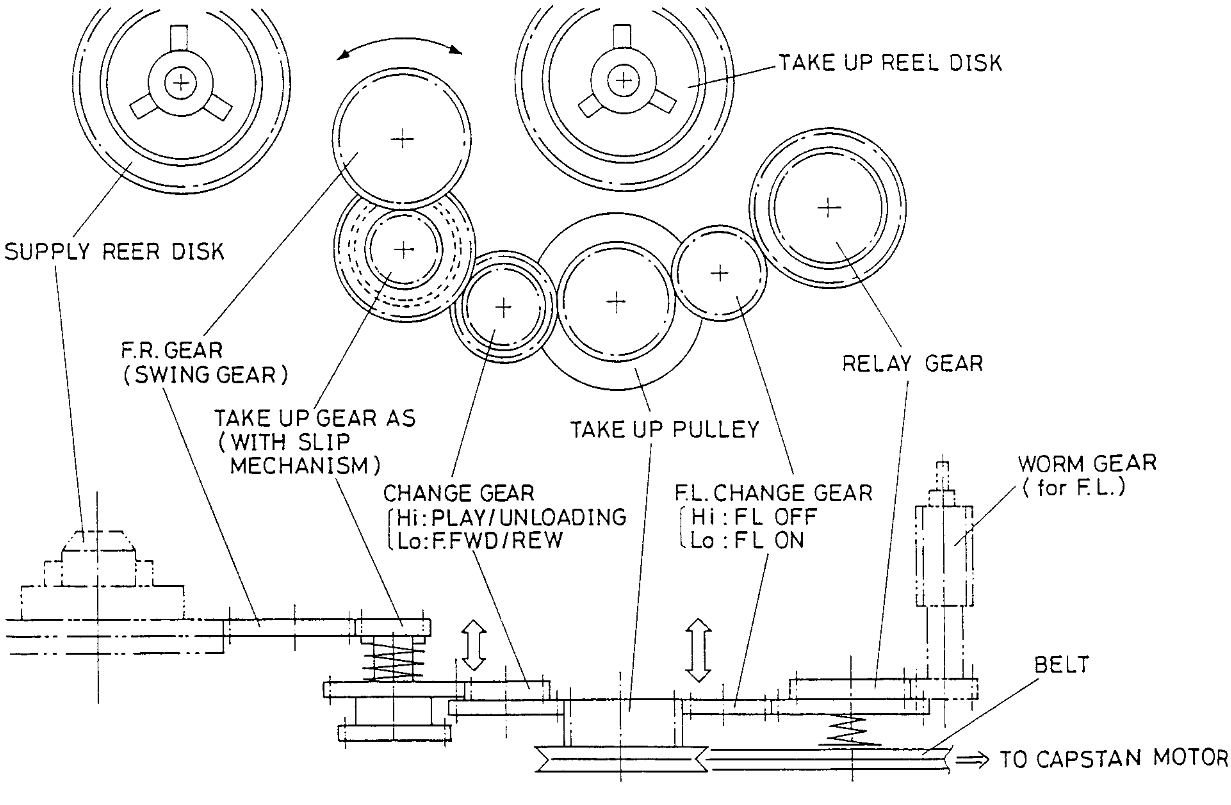


Fig. 9-2 Main Chassis (Side View)

Combination of Change Gear and F.L. Change Gear

	Mode	Change gear position	F.L. change gear position	Remarks
1	Front loading	Hi	Lo	
2	PLAY/ REC/ LOADING UNLOAD-ING	Hi	Hi	
3	FF/REW	Lo	Hi	

9-4. Loading mechanism

Fig. 9-3 shows the loading mechanism. The torque of the loading motor is reduced by the worm gear and worm wheel and is transmitted to the mode gear.
A groove for loading is provided on the back of the mode gear and the pin caulked to the pull-up arm is linked with the groove. The rack is linked with the pull-up arm so that it turns freely and load gear R is linked with the teeth at the end of the rack. The load gear L is engaged with load gear R. When the loading motor rotates, the rack is pulled in the up direction as shown in Fig. 9-3 and load gear R turns counterclockwise and load gear L turns clockwise.
The load link R is linked with load gear R so it turns freely and load link L is linked with load gear L so it turns freely in the same way. The take-up and supply guide roller assemblies are linked with the ends of both load links. When the load gears turn in the loading direction, the tape is pulled out of the cassette as loading proceeds and the links advance along the guide grooves in the chassis causing the tape to wind around the cylinder. When loading is completed, the mechansim state switch beside the loading motor detects the sixth position, "REC/PLAY", and stops the rotation of the loading motor.
Unloading is the reverse to loading, so an explanation is omitted. Since markings are provided on the rack and load gear R for phase matching, and on load gears R and L, assemble them while aligning the markings. The mode gear also has a hole for phase matching with the chassis. Align them for assembly.
Assemble the mechanism state switch so the mode gear for driving the mechanism state switch and the mechanism state switch are engaged with each other when the start point is adjusted.

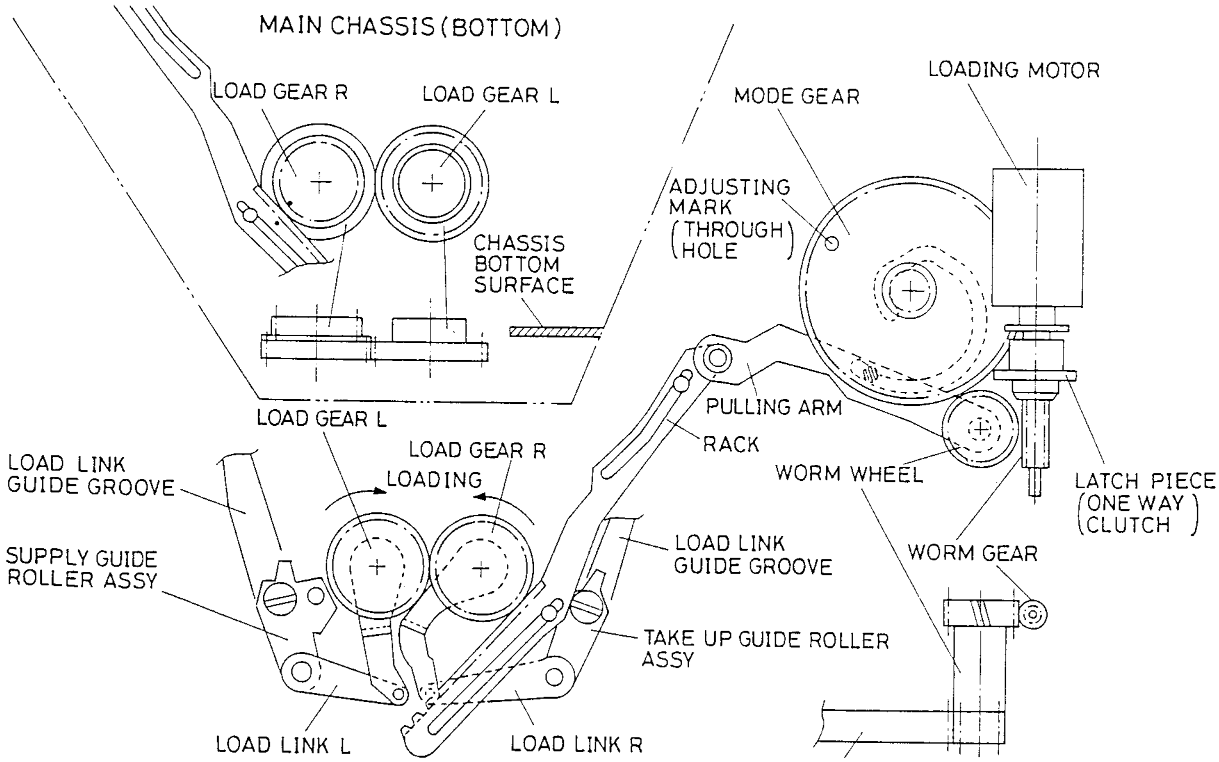

MAIN CHASSIS (BOTTOM)
LOAD GEAR R
LOAD GEAR L
MODE GEAR
LOADING MOTOR
ADJUSTING MARK (THROUGH HOLE)
CHASSIS BOTTOM SURFACE
PULLING ARM
RACK
WORM WHEEL
LATCH PIECE (ONE WAY CLUTCH)
LOAD GEAR L
LOAD GEAR R
LOADING
LOAD LINK GUIDE GROOVE
SUPPLY GUIDE ROLLER ASSY
LOAD LINK GUIDE GROOVE
WORM GEAR
TAKE UP GUIDE ROLLER ASSY
LOAD LINK L
LOAD LINK R
MODE GEAR

Fig. 9-3 Loading Mechanism

9-5. Main brake drive mechanism

Fig. 9-4 shows the main brake drive mechanism. A cam groove for driving the main brake is provided on the mode gear with which the guide pin of the brake pulling arm is linked. A pin is provided at the right end of the brake pulling arm and is linked with the groove in the brake connecting arm. When the loading motor turns in the loading direction, the brake connecting arm is pulled in the up direction in Fig. 9-4. The brake change arm linked with the brake connecting arm turns counterclockwise to pull slider B to the right. Since main brake S is contact with slider B via the relay arm and main brake T is contact with slider B, when slider B moves to the right, main brakes T and S are released from the take-up and supply reel disks to make both disks rotate freely. When the stop button is pressed in the play mode, the loading motor turns in the unloading direction and the take-up and supply guide roller assemblies starts to return along the grooves in the chassis.

At the same time, the capstan motor turns counterclockwise and presses the FR gear against the supply reel disk to wind the tape around the supply reel disk.

When the tape is housed completely in the cassette, projection P on the brake connecting arm is pushed to the left by the projection on the latch piece. This releases the link between the brake connecting arm and the pin on the brake pulling arm and the brake pulling arm is pulled quickly downward by the spring force as shown in the figure. When the brake connecting arm moves downwards rapidly, the brake change arm turns clockwise pushing slider B to the left. This turns main brake S linked with slider B clockwise and brakes the supply reel disk. At the same time, main brake T turns clockwise and brakes the take-up reel disk. The latch piece attached to the loading motor is a unidirectional clutch. When it turns clockwise and the projection is in contact with section P on the brake connecting arm, it slips. When it turns counterclockwise, it does not slip, but pushes section P forcibly to the right. This releases the link between the pin on the brake pulling arm and brake connecting arm and the brake connecting arm is returned downwards by the spring force. The operation of this latch piece section is the same as that in conventional mechanisms.

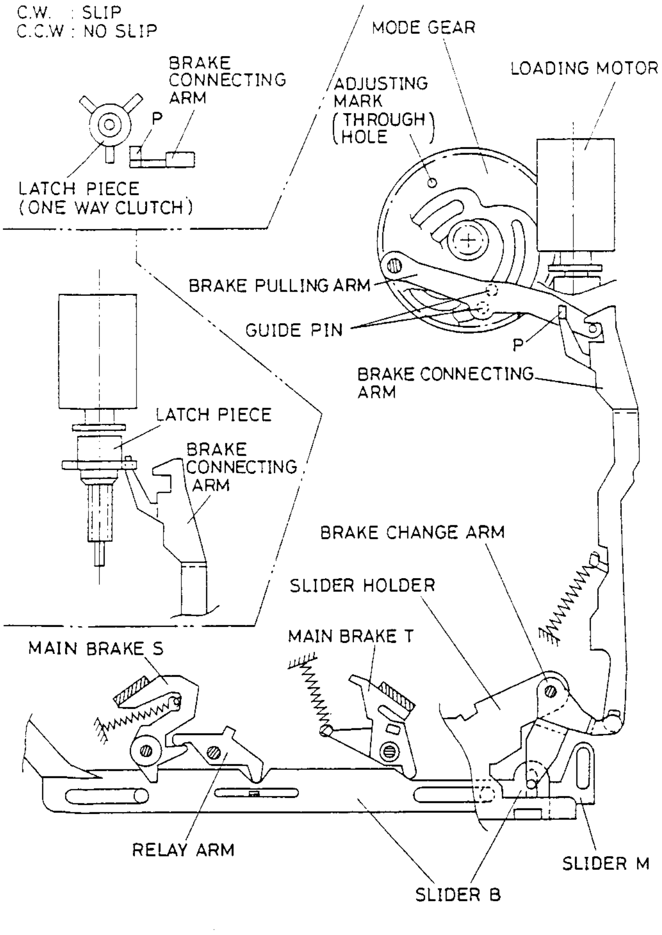


Fig. 9-4 Main Brake Drive Mechanism

9-6. Pressure roller and subbrake drive mechanism

Fig. 9-5 shows the pressure roller and subbrake drive mechanism. A groove for driving the pressure roller operation arm is provided on the top surface of the mode gear and the pin on the pressure roller operation arm is linked with the groove.

When the mode gear turns clockwise, the pressure roller operation arm turns counterclockwise. Since the hook protruding from the side of the pressure roller operation arm pulls the pressure roller spring up, the pressure roller change arm fastened to the load block bracket by a pin so that it can turn freely, turns counterclockwise. As this operation progresses, the pressure roller link fastened to the pressure roller change arm so that it can turn freely is pulled to the right. A hole is provided on the left end of the pressure roller link and the pin on the pressure roller arm is linked with it. When the pressure roller link moves to the right, the pressure roller arm turns counterclockwise to press the pressure roller against the capstan shaft.

Since the mode gear turns in the loading direction after the pressure roller is pressed against the capstan shaft, the pressure roller operation arm turns counterclockwise to pull up the pressure roller spring. However, as the movement of the pressure roller change arm is blocked because the pressure roller is pressed against the capstan shaft, the pressure roller spring is pulled up to generate pressure between the pressure roller and capstan. As the pressure roller operation arm turns, the mode change arm linked with it also turns clockwise or counterclockwise to move slider M linked with the pin on the end of the mode change arm. This moves the S subbrake linked with slider M and performs the "on" or "off" operation of the supply reel disk to apply a weak brake to the disk or release it.

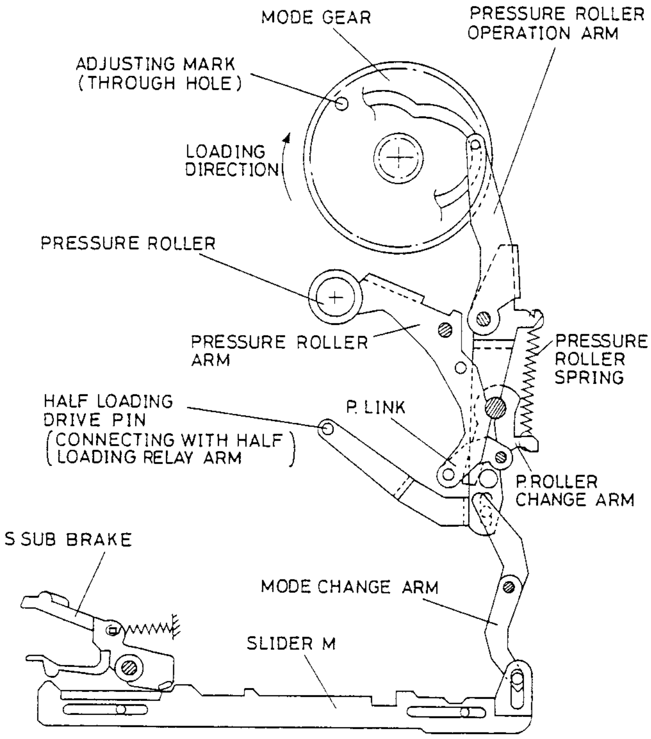

MODE GEAR
PRESSURE ROLLER OPERATION ARM
ADJUSTING MARK (THROUGH HOLE)
LOADING DIRECTION
PRESSURE ROLLER
PRESSURE ROLLER ARM
PRESSURE ROLLER SPRING
HALF LOADING DRIVE PIN (CONNECTING WITH HALF LOADING RELAY ARM)
P. LINK
P. ROLLER CHANGE ARM
S SUB BRAKE
MODE CHANGE ARM
SLIDER M

Fig. 9-5 Pressure Roller/S Sub Brake Drive Mechanism

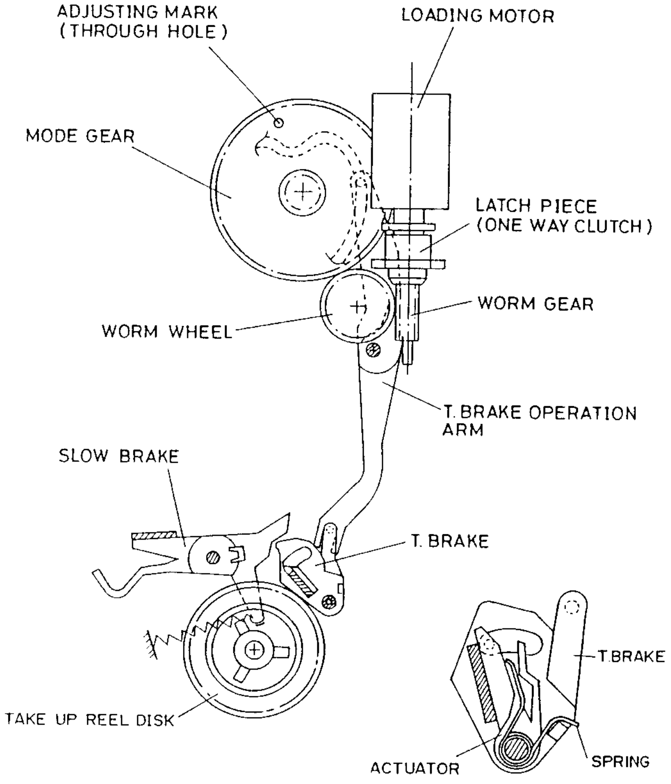

ADJUSTING MARK (THROUGH HOLE)
LOADING MOTOR
MODE GEAR
LATCH PIECE (ONE WAY CLUTCH)
WORM GEAR
WORM WHEEL
T. BRAKE OPERATION ARM
SLOW BRAKE
T. BRAKE
T.BRAKE
TAKE UP REEL DISK
ACTUATOR
SPRING

Fig. 9-6 T.Brake/Slow Brake Drive Mechanism

9-7. T brake and slow brake drive mechanism

Fig. 9-6 shows the drive mechanism of the T brake and slow brake.
The T brake operation arm linked with the groove in the bottom surface on the mode gear has a U-shape groove in its bottom end with which the pin on the T brake is linked. As the mode gear turns, the T brake operation arm moves to the left and right to press or release the T brake against/from the take-up reel disk. This T brake applies a weak brake to the take-up reel disk during loading and unloading to prevent slack tape. The S subbrake is pressed against the supply reel disk.
The T brake also applies a weak brake to the take-up reel disk to prevent slack tape. The top left edge of the T brake is in contact with the slow brake. As the T brake operates, the slow brake is pressed against the capstan flywheel to reduce its inertia, thus making the capstan wheel rotate and stop quickly during slow motion.

9-8. Z-mechanism operation table

Fig. 9-7 shows the Z-mechanism operation table.
"HALF" in the table shows that the component is stopped between the stop and operation positions.
Before the eject operation the tape is rewound for a short period to take up tape slack. The main brake on the take-up side is applied and that for the supply side is off in the eject mode.

9-9. Front loading mechanism

Fig. 9-8 shows the front loading mechanism.
In this mechanism, a motor exclusively for front loading is not used and the motive power of the capstan motor is used for the front loading operation.
When a cassette is inserted into the cassette holder and pushed in by approx. 13 mm, the microswitch is pressed by switch lever B and the capstan motor turns "on" to perform the loading operation. During FL loading operation, the main brake T is applied to the take-up reel disk and main brake S is not applied to the supply reel disk. When loading is completed, switch lever A is pushed down, switch lever B goes up and the microswitch goes from "Lo" to "Hi", thus braking the capstan motor to stop it.

When eject is commanded, the capstan motor rewinds the tape for a short period to remove slack before eject. During this operation, the main brakes are applied to both reel disks. Then, the capstan motor runs in reverse and the cassette is ejected. An accumulator is provided in the worm wheel assembly.

When a cassette is inserted, the inner gear is turned, but the outer gear is stopped by the accumulator. When the microswitch is pressed and goes from "Lo" to "Hi", the capstan motor starts to turn in the loading direction and performs the loading operation.

SW NO.	MODE SWITCH POSITION \ PARTS NAME	MAIN BRAKE		T. BRAKE	S SUB BRAKE	TENSION BAND	PRESSURE ROLLER	SLOW BRAKE	F.L. CHANGE GEAR	H.L. ARM	REMARKS
		T	S								
1	EJECT	ON	OFF	ON	ON	OFF (STOP POSITION)	OFF	OFF	*2 ON (Lo: POSITION)	OFF	*2 FL MECHA. DRIVE
2	STOP	ON		ON	ON	OFF	OFF	OFF	OFF (Hi: POSITION)	OFF (HALE POSITION)	
3	FF/REV	OFF		OFF	ON	OFF	OFF	OFF	OFF (Hi POSITION)	*1 ON	*1 NORMAL POSITION
4	REC PAUSE	OFF		ON	ON	OFF (HALF POSITION)	OFF (HALF POSITION)	OFF	OFF (Hi POSITION)	ON	
5	REVERSE	OFF		ON	OFF	OFF (HALF POSITION)	ON	OFF	OFF (Hi POSITION)	ON	REC PAUSE REVERSE FEED
6	REC/PLAY	OFF		OFF	OFF	ON	ON	OFF	OFF (Hi POSITION)	ON	
7	SLOW	OFF		OFF	OFF	ON	ON	ON	OFF (Hi POSITION)	ON	

Fig. 9-7 Operation Chart

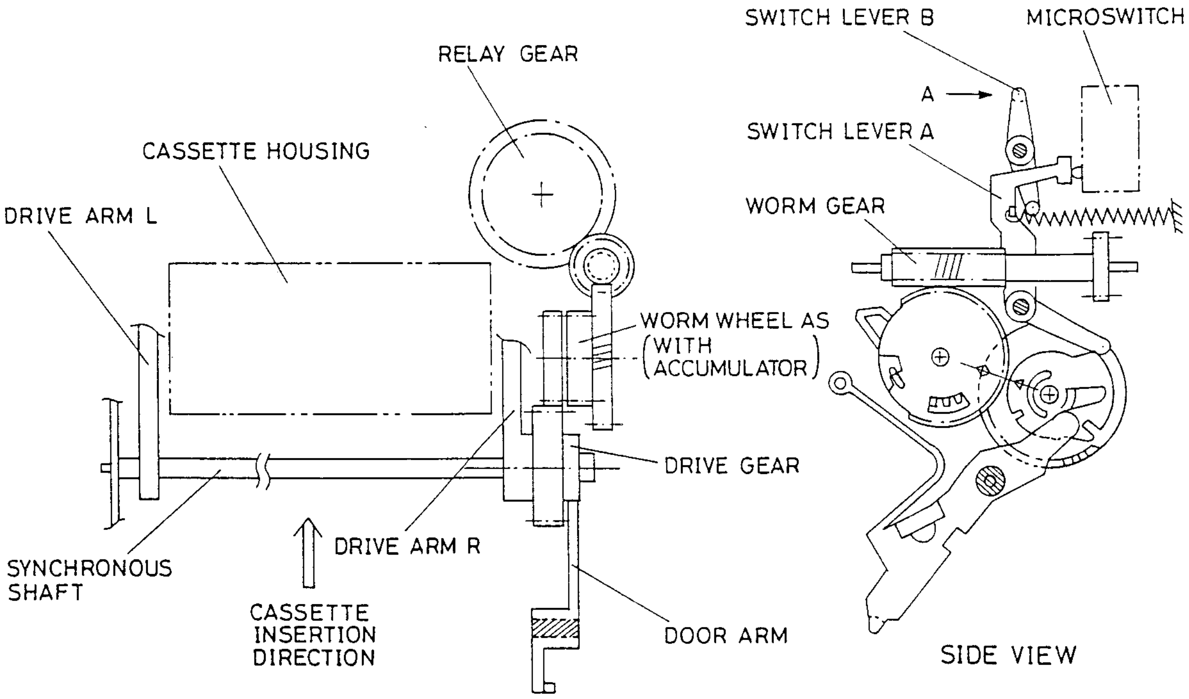

SWITCH LEVER B
MICROSWITCH
RELAY GEAR
A
SWITCH LEVER A
CASSETTE HOUSING
WORM GEAR
DRIVE ARM L
WORM WHEEL AS (WITH ACCUMULATOR)
DRIVE GEAR
DRIVE ARM R
SYNCHRONOUS SHAFT
CASSETTE INSERTION DIRECTION
DOOR ARM
SIDE VIEW

Fig. 9-8 Front Loading Mechanism

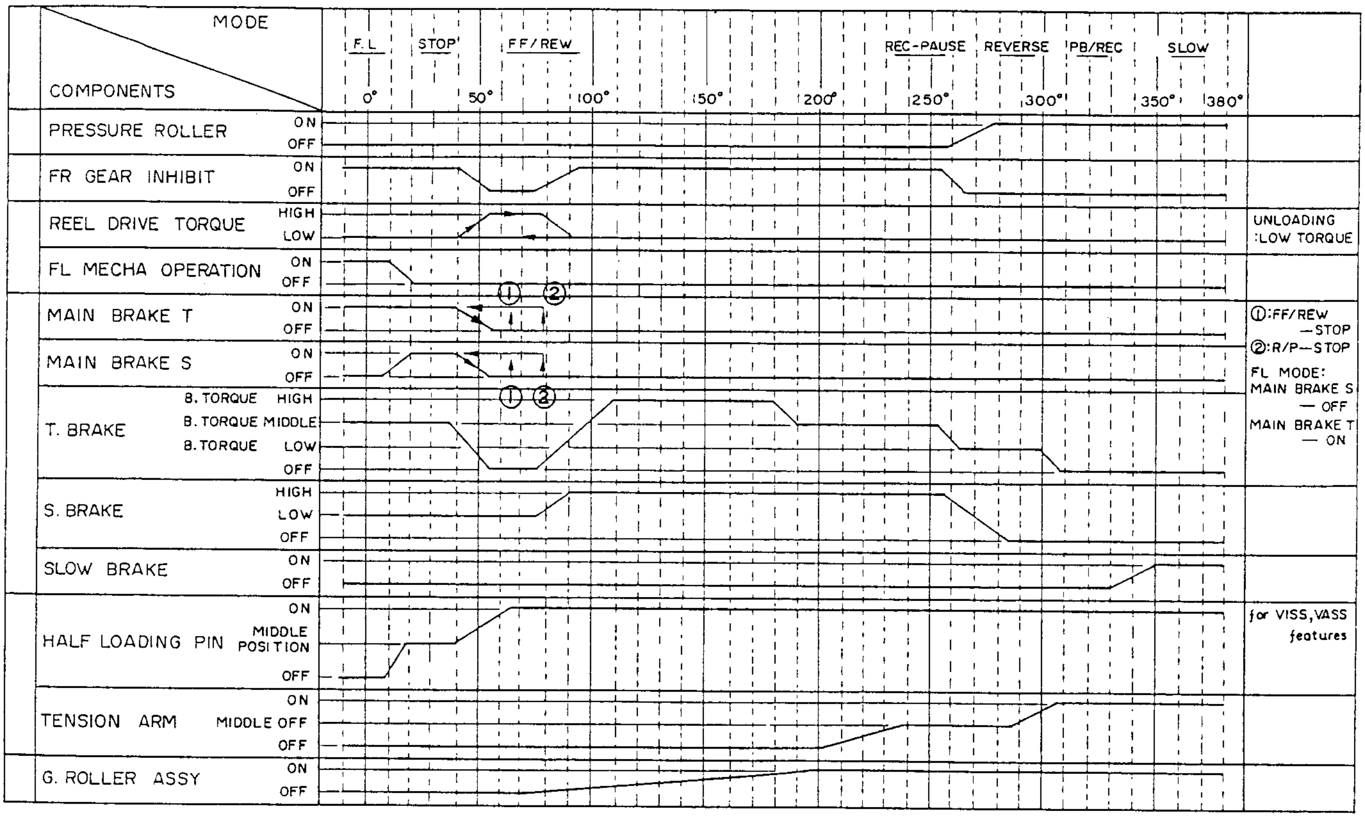

MODE
COMPONENTS
F.L
STOP
FF/REW
REC-PAUSE
REVERSE
PB/REC
SLOW
0°
50°
100°
150°
200°
250°
300°
350°
380°
PRESSURE ROLLER
ON
OFF
FR GEAR INHIBIT
ON
OFF
REEL DRIVE TORQUE
HIGH
LOW
UNLOADING :LOW TORQUE
FL MECHA OPERATION
ON
OFF
MAIN BRAKE T
ON
OFF
MAIN BRAKE S
ON
OFF
①:FF/REW —STOP
②:R/P—STOP
FL MODE: MAIN BRAKE S — OFF MAIN BRAKE T — ON
T. BRAKE
B. TORQUE HIGH
B. TORQUE MIDDLE
B. TORQUE LOW
OFF
S. BRAKE
HIGH
LOW
OFF
SLOW BRAKE
ON
OFF
HALF LOADING PIN
ON
MIDDLE POSITION
OFF
for VISS, VASS features
TENSION ARM
ON
MIDDLE OFF
OFF
G. ROLLER ASSY
ON
OFF
①
②

Fig 9-9 TIMING CHART OF Z-CHASSIS

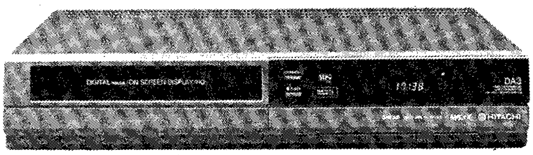
HITACHI

Wartungsanleitung

TK Nr. 3033G

VT-M630E/M640E(CT)
VT-M635E/M645E(VPS)
VT-M636E/M646E(VPS)

Technische Daten



TECHNISCHE DATEN

Format:	VHS-PAL-Standard
Aufnahme:	Schrägspurverfahren mit zwei drehenden Bildköpfen
Bandgeschwindigkeit:	23,39 mm/s
Bandbreite:	12,7 mm
Betriebstemperatur:	5°C bis 40°C
Video:	PAL-Farbsignale (System B und G) und CCIR-Schwarzweißsignale, 625 Zeilen
Spieldauer:	240 min. (mit Cassette E-240)
Empfangskanäle:	VHF Kanal 2 bis 12 VHF Kanal U1 bis U5 Kabelfernsehkanäle S1 bis S20 HYPER S21 bis S41 UHF Kanal 21 bis 69
HF-Ausgang:	UHF Kanal 37 (einstellbar Kanal 30–39) (System G)
Video-Eingang:	0,5 – 1,5 Vs-s, 75 Ohm, asymmetrisch
Video-Ausgang:	1 Vs-s, 75 Ohm, asymmetrisch
Fremdspannungsabstand (Video):	Mehr als 43 dB
Horizontalauflösung:	Farbe 260 Zeilen
Audio	
Eingang:	–3,8 dBm, 50 kOhm
Ausgang:	–3,8 dBm, 1 kOhm
Fremdspannungsabstand:	43 dB
Frequenzbereich:	70 Hz bis 12 kHz
Stromversorgung:	220 V 50 Hz
Leistungsaufnahme:	26 W (einschließlich Timer)
Timer:	24-Stunden-Digitalanzeige
Abmessungen (B x H x T):	435 x 81 x 332 mm
Gewicht:	Etwa 6 kg
Zubehör:	Antennenkabel x 1 Infrarot-Fernbedieneinheit x 1 Batterie x 2

* Änderung des Designs und der technischen Daten ohne vorhergehende Bekanntgabe vorbehalten.

Anleitungen für die Modelle VT-M630E/640E

Benennung	Sprache	Anleitung-Nr.	Enthaltene Kapitel
Technische Daten	Englisch	3032E	Chapitres 1 - 6
	Deutsch	3033G	Kapitel 1 - 6
Technische Informationen	Englisch	3034E	---
	Deutsch	3035G	---

VHS
Dieser Video-Recorder entspricht dem VHS-Format. Für richtigen Betrieb müssen daher VHS-Magnetband-Cassetten verwendet werden.

Änderungen der Technischen Daten und Teile im Sinne ständiger Verbesserung vorbehalten.

Video-Cassettenrecorder

Mai 1989 TOKAI WORKS

INHALTSVERZEICHNIS

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TIMER	5-5	/	5-7
BUCHSE	5-9	/	5-19,23
AUDIO	5-11	/	5-19,23
ZEITLUPEN-TREIBER	5-12	/	5-12
SERVO	5-13	/	5-19,23
SENSOR/MOTORTREIBER ..	5-15	/	5-16
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Sicherheitshinweise

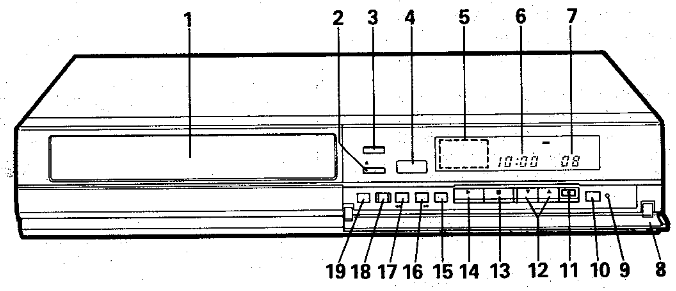
Die folgenden Vorsichtsmaßnahmen sind einzuhalten, wenn Wartungsarbeiten an diesem Modell ausgeführt werden.

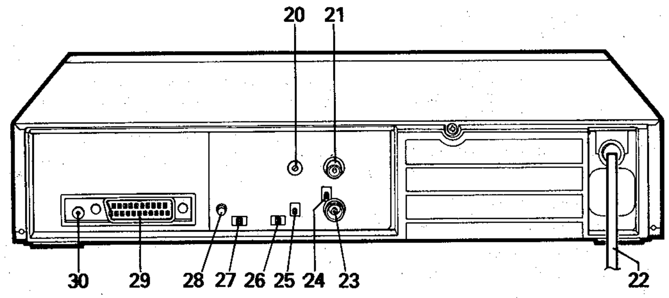
1. Da verschiedene Teile dieses Gerätes besondere Sicherheitsfunktionen aufweisen, nur Hitachi Original-Ersatzteile verwenden. Besonders kritische Teile im Netzteil dürfen nicht durch Teile anderer Hersteller ersetzt werden. Die kritischen Teile sind in den Schaltplänen und Leiterplatten-Diagrammen mit dem Symbol ⚠ gekennzeichnet.
2. Bevor das reparierte Gerät an den Kunden ausgeliefert wird, muß der Wartungstechniker das Gerät einer gründlichen Prüfung unterziehen, um optimale Betriebssicherheit sicherzustellen und die Gefahr elektrischer Schläge auszuschließen.

VERGLEICHSTABELLE

	Benennung		VT-M640E/M645E/M646E	VT-M630E/M635E/M636E	VT-M620E/M625E/M626E
Markmale	HQ (High Quality)		Verwendet	Verwendet	Verwendet
	Trick-Wiedergabe		° Bildsuchlauf ° Fein-Standbild ° Einzelbild ° Wiederholung ° Fein-Zeitlupe	° Bildsuchlauf ° Fein-Standbild ° Einzelbild ° Wiederholung ° Fein-Zeitlupe	° Bildsuchlauf ° Standbild/Pause ° Einzelbild ° Wiederholung
	Automatische Endlosspiel		Vorhanden	Vorhanden	Vorhanden
	Modusverriegelungsfunktion		Vorhanden	Vorhanden	Vorhanden
	Bandrestzeit		Vorhanden	Vorhanden	Vorhanden
	Bildregler		Vorhanden	Vorhanden	Vorhanden
	Timer-Aufnahmeprogramme		8 Programme/1 Jahr	8 Programme/1 Jahr	8 Programme/1 Jahr
	Timer-Speicherschutz		Etwa 15 Minuten	Etwa 15 Minuten	Etwa 15 Minuten
	O.S.D.		Vorhanden	Vorhanden	Nicht vorhanden
	Editierschalter		Vorhanden	Vorhanden	Nicht vorhanden
	Sofortaufnahme in Intervallen (IRT)		Startzeit und Aufnahmedauer einstellbar	Startzeit und Aufnahmedauer einstellbar	Startzeit und Aufnahmedauer einstellbar
	Memory-Stopfunktion		Vor- und Rücklauf	Vor- und Rücklauf	Vor und Rücklauf
	Kanal-Abstimmfunktion		Frequenz-Synthesizer-Tuner (Abstimmautomatik)	Frequenz-Synthesizer-Tuner (Abstimmautomatik)	Frequenz-Synthesizer-Tuner (Abstimmautomatik)
	Fernbedienung		VT-RM653E	VT-RM633E	VT-RM633E
Chassis	Chassis-Bauart		ZA	ZA	ZA
	Kopftrommelmotor		Dreiphasen-Motor mit äußerem Rotor, Frequenzgenerator: 300Hz	Dreiphasen-Motor mit äußerem Rotor, Frequenzgenerator: 300Hz	Dreiphasen-Motor mit äußerem Rotor, Frequenzgenerator: 300Hz
	Video-Kopfbestückung		DA4-Köpfe SP CH-1/CH-2: 48 μm LP CH-1/CH-2: 30 μm	DA3-Köpfe CH-1/CH-2: 57 μm CH-3: 57 μm	2 Köpfe CH-1/CH-2: 57 μm
	Halbladung-Mechanismus		Vorhanden	Vorhanden	Vorhanden
Hauptregelungs-ICs	Video-System	V-Signalverarbeitung	HT4937C (IC201)	HT4937C (IC201)	HT4937B (IC201)
		Chromasignalverarbeitung	HES8455C (IC204)	HES8455C (IC204)	HES8455C (IC204)
		CCD Verzögerung	HN7147B (IC206)	HN7147B (IC206)	HN7147B (IC206)
	Audio-System	Aufnahme/Wiedergabe-Verstärker	LA7295 (IC401)	LA7295 (IC401)	LA7295 (IC401)
	Buchse	Eingangsumschaltung	M5201L-AUDIO (IC2503) NJM2248S-VIDEO (IC1502)	M5201L-AUDIO (IC2503) NJM2248S-VIDEO (IC1502)	M5201L-AUDIO (IC2503) NJM2248S-VIDEO (IC1502)
	Servo-System	Drehzahl/Phasenregelung	BU2749S (IC601)	BU2749S (IC601)	BU2745S (IC601)
		Verstärker	LA7116 (IC602)	LA7116 (IC602)	LA7116 (IC602)
		Kopftrommelmotor-Treiber	LB1684H (IC1651)	LB1684H (IC1651)	LB1684H (IC1651)
		Trick-Wiedergaberegelung	M54874P (IC1601)	M54874P (IC1601)	-----
	System-regelung	Systemregelungs-μP	HD4074019 (IC901)	HD4074019 (IC901)	HD4074008A03S (IC901)
		Lademotor-Treiber	BA6209U4 (IC902)	BA6209U4 (IC902)	BA6209U4 (IC902)
	Timer	Timer-μP	M50957-680SP (IC701)	M50957-680SP (IC701)	M50957-680SP (IC701)
	Kanal-Abstimm-system	Abstimm-Schnittstellen	μPC1484CA -F.S- (IC801)	μPC1484CA -F.S- (IC801)	μPC1484CA -F.S- (IC801)
		Kanalspeicher	M6M80021	M6M80021	M6M80021
	OSD	Zeichengenerator	PLT-623-009 (IC1510)	PLT-623-009 (IC1510)	-----
	Regler	Multi-Regler	STK5372H (IC851)	STK5372H (IC851)	STK5372H (IC851)
		5,6 V-Regler	NJM78M05 (IC802)	NJM78M05 (IC802)	NJM78M05 (IC802)
	VPS	VPS μP	HES8052 (IC1511)	HES8052 (IC1511)	SDA5642 (IC101)

BEDIENUNGSELEMENTE UND IHRE FUNKTIONEN





1. **Cassettenschacht**
Eine Cassette einschieben, worauf das Band automatisch eingefädelt wird.
Hinweis: Mit dem Einschieben der Cassette wird automatisch die Stromversorgung eingeschaltet.

2. **Auswurftaste**
Diese Taste drücken, wenn eine Cassette entfernt werden soll.

3. **Betriebsschalter**
Schaltet die Stromversorgung des Videorecorders ein oder aus.

4. **Infrarot-Empfänger**
Dient für den Empfang der Infrarotstrahlung, die bei Betätigung der Fernbedienung ausgesandt wird.

5. **Betriebsartenanzeige**
"OO" Cassette in den Cassettenschacht eingesetzt.
"REC" Bandlaufwerk auf Aufnahmemodus geschaltet.
" ▷ " Bandlaufwerk auf Wiedergabemodus geschaltet.
"◁◁" Leuchtet während der Rücklauffunktion und blinkt während der Bildsuchlauffunktion rückwärts.
"▷▷" Leuchtet während der Schnellvorlauffunktion und blinkt während der Bildsuchlauffunktion vorwärts.
"▯▯" Bandlaufwerk auf den Wiedergabe/Aufnahme-Pausemodus geschaltet.
"OPE." Der Betriebsschalter (OPERATE) ist eingeschaltet.

6. **Digital-Display**
Hier werden normalerweise die Uhrzeit und der Wochentag angezeigt. Die COUNT/REMAIN Taste auf der Fernbedienung drücken, um von der Uhrzeitanzeige auf die Bandzählwerksanzeige oder die Restbandanzeige umzuschalten.

7. **Fernseh-Stationsnummernanzeige**
Zeigt die Fernsehstationsnummer der angewählten Station an.

8. **Klappe zum zweiten Bedienungsfeld**

9. **Display-Rückstelltaste**
Bei Fehlbetrieb der Digital-Anzeige bzw. wenn keine Funktion aktiviert werden kann, diese Taste drücken, um eine Rückstellung der Anzeige vorzunehmen. Die richtige Uhrzeit einstellen.

10. **IRT-Starttaste**
Verwenden Sie diese Taste gemeinsam mit der REC/LENGTH Taste für vereinfachte Timer-Aufnahme. Der Videorecorder beginnt automatisch mit der Aufnahme, wenn die mit Hilfe der IRT-Starttaste angewählte Zeit erreicht ist und dauert für den mittels REC/LENGTH Taste eingestellten Zeitraum an, worauf die Stromversorgung ausgeschaltet wird.

11. **Aufnahme/Aufnahmedauertaste (REC/LENGTH)**
Die REC/LENGTH Taste einmal drücken, um mit der Aufnahme zu beginnen. Nochmaliges Drücken läßt Sie eine Aufnahmedauer innerhalb von 4 Stunden anwählen. Nach der Aufnahme für die voreingestellte Aufnahmedauer erfolgt das Ausschalten automatisch.
Diese Funktion ist besonders vorteilhaft, wenn Sie während der Aufnahme Ihr Heim verlassen müssen.

12. **TV PROG (Programm)/TRACKING Tasten**
Durch Drücken dieser Tasten ist das zu empfangende bzw. aufzunehmende Fernsehprogramm anzuwählen.
Sie können durch Drücken dieser Taste auch die "AU" Position* anwählen, um das über die EURO Buchse eingegebene Programm zu empfangen oder aufzunehmen.
* Eine Fernsehstation höher oder tiefer als der Bereich der programmierten Stationen.
Die gleichen Tasten dienen als Spurlagentasten (TRACKING), um das Rauschen während der Wiedergabe von dem Videorecorder zu minimieren.

13. **Stopptaste**
Die Stopptaste muß immer betätigt werden, bevor von der Aufnahmefunktion auf eine andere Bandlauffunktion umgeschaltet wird.

14. **Wiedergabetaste**
Hinweis: Mit dem Einsetzen einer Cassette (mit entfernter Löschschutzlamelle) wird automatisch mit der Wiedergabe begonnen.

15. **Pause/Standbildtaste**
Während der Aufnahme diese Taste drücken, um die Aufnahme kurzzeitig zu unterbrechen. Wird diese Taste während der Wiedergabe gedrückt, dann wird das Gerät auf die Standbildfunktion geschaltet. Die Taste nochmals betätigen, um die entsprechende Funktion freizugeben.

16. **Schnellvorlauftaste**
Diese Taste hat zwei Funktionen:
a) Schneller Vorlauf des Bandes ohne Wiedergabebild.
b) Während Bildwiedergabe schneller Bildsuchlauf vorwärts.

17. **Rückspultaste**
Diese Taste hat zwei Funktionen:
a) Schnelles Rückspulen ohne Wiedergabebild.
b) Während Bildwiedergabe schneller Bildsuchlauf rückwärts.

18. **PRESET-Taste**
Drücken, um die Fernsehstationen vorzuprogrammieren.

19. **0000/E240 Taste**
Diese Taste drücken, um das Bandzählwerk auf "0000" zu stellen oder die Restzeit für eine E240 Cassette zu berechnen.

20. **HF-Kanalregler**
Den TSG-Ein/Aus-Schalter auf Position "ON" stellen, um bei Bedarf mit Hilfe dieses Reglers den Videorecorder-Ausgangskanal zu verstellen.

21. **HF-Ausgang**
Mit dem Antennen-Eingang des Fernsehempfängers verbinden.

22. **Netzkabel**

23. **Antennen-Eingangsbuchse**
Externe Antenne hier anschließen.

24. **Dämpfungsschalter**
Diesen Schalter normalerweise auf Position OFF belassen. Die Position ON ist nur dann zu benutzen, wenn es bei dem Empfang von starken Ortssendern zu Interferenzstörungen kommt.

25. **TSG-Ein/Aus-Schalter**
Diesen Schalter einschalten, um zu kontrollieren, ob der Video-Kanal Ihres Fernsehempfängers richtig eingestellt ist. Gegebenenfalls die Einstellung vornehmen und danach diesen Schalter wieder ausschalten.

26. **Editierschalter (EDIT)**
Diesen Schalter einschalten, wenn dieser Videorecorder beim Überspielen von Bandmitschnitten für die Wiedergabe verwendet wird. Das kopierte Band erzeugt dadurch klarerer Bilder. Diese Funktion arbeitet nicht, wenn dieser Videorecorder für die Aufnahme verwendet wird.

27. **AUTO/COLOUR-Wahlschalter**
AUTO: In dieser Position wird automatisch zwischen Farb- und Schwarzweißsignalen umgeschaltet. Diese Schalterstellung für Wiedergabe oder Aufnahme von PAL-Signalen verwenden.
COLOUR: Bei Aufnahme von PAL-Signalen in größerer Entfernung vom Fernsehsender kann es zu Farbverlusten kommen. In diesem Fall ist diese Position sowohl für die Aufnahme als auch für die Wiedergabe zu verwenden.

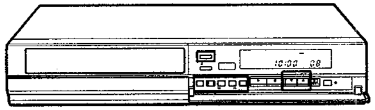
28. **Regler für Vertikalsynchronisierung**
Falls während der Standbildfunktion vertikales Bildzittern auftritt, diesen Regler so einstellen, daß diese Bildstörungen auf ein Minimum begrenzt werden.

29. **EURO-Buchse**
Wird verwendet, wenn der Videorecorder unter Verwendung eines speziellen Verbindungskabels an einen mit EURO- oder DIN-Buchse ausgerüsteten Fernsehempfänger angeschlossen wurde. Nähere Einzelheiten erfahren Sie bei Ihrem Fachhändler.

30. **Pause-Buchse**
Hier kann das Kabel zur Steuerung der Kamera-Pausefunktion angeschlossen werden.

EINSTELLEN DES EINGEBAUTEN VIDEO-TUNERS

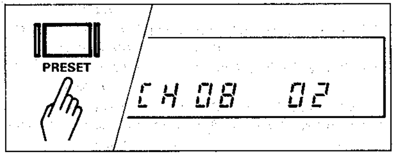
Dieser Videorecorder wird komplett mit einem Fernsehtuner geliefert, der über die erforderliche Abstimmeinheit verfügt. Die einzelnen TV-Programme können gespeichert und danach mit Hilfe der Programmspeicher-Wahltasten (TV PROG) einzeln abgerufen und aufgezeichnet werden. Das Einstellen der TV-Sender muß wie folgt durchgeführt werden.



Bedienungselemente

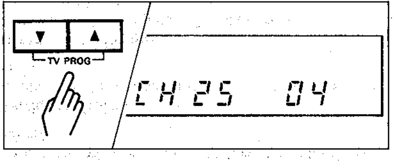
1 Den Betriebsschalter des Videorecorders und den Fernsehempfänger einschalten und danach den Fernsehempfänger auf den programmierten Video-Kanal einstellen

2 Die Programmiertaste (PRESET) einmal drücken.



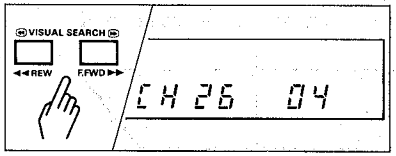
Die Digitalanzeige ändert von der Uhrzeit- auf die Kanalanzeige.

3 Die TV PROG Taste auf dem Videorecorder für die Wahl des zu programmierenden Programmspeichers drücken.



Die obige Anzeige bedeutet z.B., daß Programmspeicher 4 angewählt wurde.
Hinweis: Durch Drücken der TV PROG Taste kann nun die angezeigte Programmspeichernummer auf "01" bis "69" und "AU" eingestellt werden (in beiden Richtungen). Jede beliebige Programmspeichernummer kann angewählt werden.

4 Die REW oder F.FWD Taste (−SEARCH+) drücken und freigeben, um mit der Abstimmung zu beginnen.

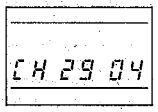


Auf dem Bildschirm erscheint nun ein Programm, wenn ein solches ausgestrahlt wird. Falls die empfangene TV-Station nicht der gewünschten Sendeanstalt entspricht, die REW oder F.FWD Taste (−SEARCH+) nochmals drücken. Diese Vorgänge wiederholen, bis die gewünschte Sendeanstalt eingestellt ist.

Hinweise:

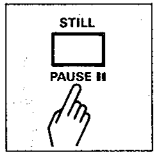
- Die F.FWD (SEARCH+) Taste drücken; nun erfolgt der Sendersuchlauf in der Reihenfolge VHF (2 bis 12) → UHF (21 bis 69) → CATV (S1 bis S20) → HYPER BAND (S21 bis S41) → VHF (U1 bis U5), wobei während des Sendersuchlaufs der CATV- und HYPER-Kanäle der Kolon (:) erscheint.
- Die REW (SEARCH−) Taste drücken, wodurch der Sendersuchlauf in der umgekehrten Reihenfolge (siehe oben) erfolgt.

Direkte Senderwahl der VHF (2 bis 12) und UHF (21 bis 69) Stationen
Die Zehnertastatur der Fernbedienung anstelle des obigen Schrittes 4 drücken, um die gewünschten VHF- oder UHF-Station aufzurufen.



Um z.B. die UHF-Station Kanal 29 auf den Programmspeicher "04" einzustellen, die TV PROG Taste drücken, um den Programmspeicher "04" anzuzeigen (Schritt 3), und danach die Zifferntasten 2 und 9 auf der Fernbedienung drücken.

5 Die STILL/PAUSE (STORE) Taste drücken, sobald die gewünschte Sendeanstalt aufgefunden wurde. Nun wird das Symbol "− −" angezeigt.
Hinweis: Falls das Bild des eingestellten Senders nicht klar erscheint, die Feinabstimmung mit Hilfe der REW oder F.FWD Taste (−SEARCH+) vornehmen. **Nach der Feinabstimmung muß nochmals die STILL/PAUSE (STORE) Taste gedrückt werden.**

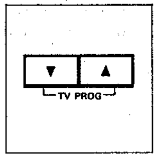


6 Für die Einstellung anderer Sendeanstalten die obigen Schritte 3 bis 5 sinngemäß befolgen.
In den Speicher können bis zu 69 Sendeanstalten eingegeben werden.

7 Nachdem Sie alle gewünschten Sendeanstalten gespeichert haben, die PRESET Taste nochmals betätigen.

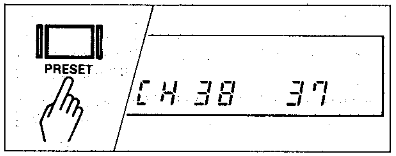
Die so eingestellten Sendeanstalten können nun mit Hilfe der TV PROG Tasten abgefragt werden.

Programmspeicherwahltaste
Mit Hilfe der Programmspeicherwahltasten am Videorecorder kann auf den nächsthöheren oder niedrigeren Programmspeicher weitergeschaltet werden.

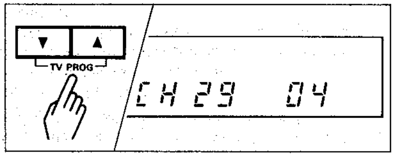


Löschen unerwünschter Programmspeicher
Die gewünschten Sendeanstalten können für den Suchlauf mittels Programmspeicherwahltaste neu arrangiert werden.

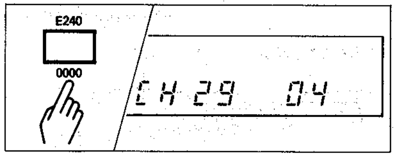
1 Die PRESET-Taste einmal drücken.



2 Die Programmspeicherwahltaste (TV PROG) drücken, bis ein unerwünschter oder nicht belegter Programmspeicherplatz aufgefunden wird.



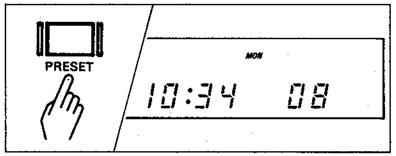
3 Die 0000/E240 Taste einmal betätigen.



Der Ton verstummt, um damit anzuzeigen, daß der entsprechende Programmspeicher gelöscht wurde.

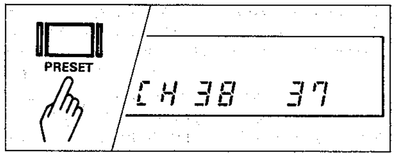
4 Die Schritte 2 und 3 wiederholen, bis alle unerwünschten oder nicht mehr benötigten Programmspeicher gelöscht wurden.

5 Danach die PRESET-Taste nochmals drücken.

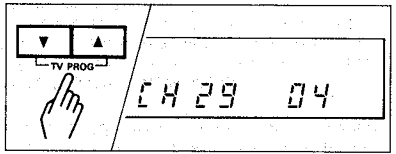


Einstellen zusätzlicher Sendeanstalten
Zusätzliche Sendeanstalten können auch zu einem späteren Zeitpunkt eingestellt werden.

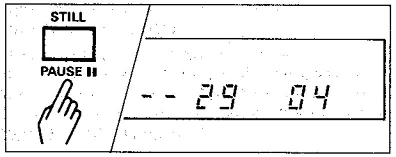
1 Die PRESET-Taste einmal drücken.



2 Die TV PROG Wahltasten betätigen, bis der früher ausgelassene Programmspeicher angezeigt wird, und diesen mit dem Kanal der Sendeanstalt belegen.



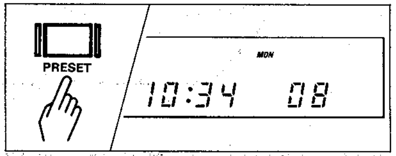
3 Die STILL/PAUSE (STORE) Taste drücken.



Ein Kontrollton ertönt und zeigt damit die Speicherung der angewählten Station an.

4 Gegebenenfalls die Schritte 2 und 3 für andere Programmspeicher wiederholen.

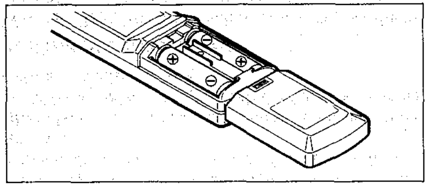
5 Nachdem Sie die gewünschten Stationen gespeichert haben, die PRESET-Taste nochmals betätigen.



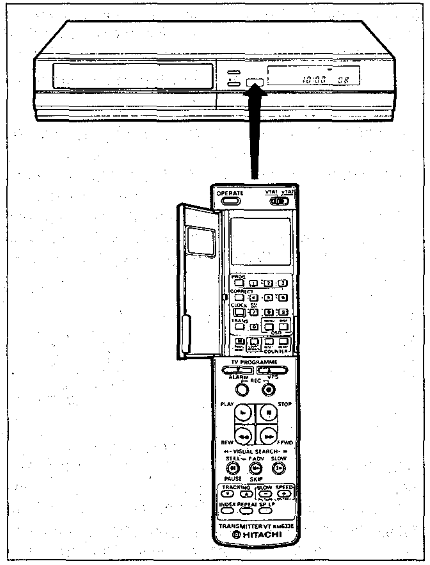
FERNBEDIENUNG

Mit Hilfe der Infrarot-Fernbedienung können Sie diesen Videorecorder bequem von Ihrem Fernsehstuhl aus steuern. Die Fernbedienung verfügt über die gleichen Funktionstasten wie der Videorecorder.

Stromversorgung der Infrarot-Fernbedienung
Die Stromversorgung der Infrarot-Fernbedienung erfolgt mit Hilfe von zwei Batterien (IEC-Standardgröße R6). Die Lebensdauer dieser Batterien beträgt etwa ein Jahr, hängt aber natürlich von den Betriebsbedingungen und der Verwendungshäufigkeit ab. Wenn sich die Gerätefunktionen nicht mehr richtig steuern lassen oder mit der Fernbedienung sehr nahe an den Videorecorder herangegangen werden muß (um die gewünschten Funktionen aktivieren zu können), die Batterien erneuern.

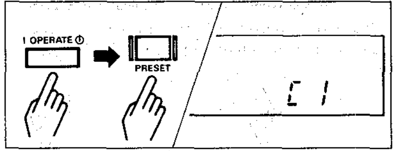


Fernbedienung
Für die Fernbedienung ist der VTR 1/VTR 2 Schalter an der Fernbedienung auf Position VTR 1 zu stellen, worauf die Fernbedienung auf den Empfänger an der Voderseite des Videorecorders zu richten ist.



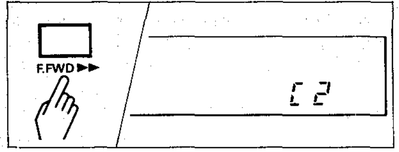
VTR 1/VTR 2 Schalter
Die mitgelieferte Fernbedienung kann zwei VT-M630E Modelle fernbedienen. Für das Überspielen von Bändern können z.B. zwei Videorecorder für Aufnahme und Wiedergabe von einer Fernbedienung aus fernbedient werden. Bei der Fernbedienung von zwei Videorecordern den anderen Videorecorder in der Positon VTR 1 und diesen Videorecorder in der VTR 2 Position fernbedienen. Dieser Videorecorder wurde jedoch voreingestellt, um auf Position VTR 1 fernbedient zu werden. Daher sind die folgenden Vorgänge erforderlich, um diesen Videorecorder in der Position VTR 2 fernbedienen zu können.

1 Den Betriebsschalter (OPERATE) ausschalten und die unter der Klappe zum zweiten Bedienungsfeld angeordnete PRESET Taste drücken.



" C 1 " erscheint in der Anzeige.

2 Die Schnellvorlauftaste drücken.



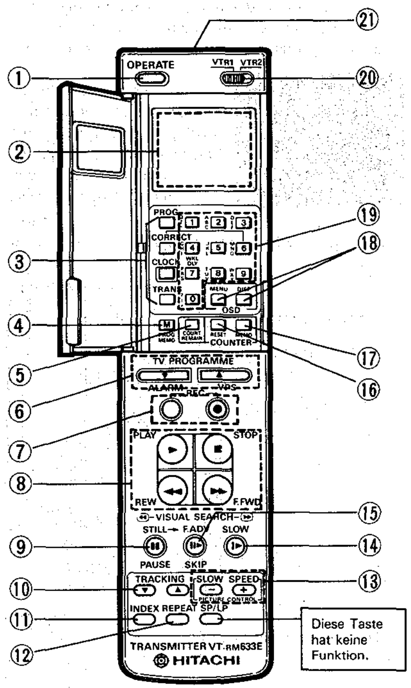
Die Anzeige ändert auf " C 2 ".

3 Die PRESET-Taste nochmals drücken.

Nun kann dieser Videorecorder in der Position VTR 2 fernbedient werden.

Hinweis: Um diesen Videorecorder wieder auf Position VTR 1 fernbedienen zu können, die obigen Vorgänge verwenden, um " C 1 " anzuzeigen.

Regler und Funktionen



① **OPERATE:** Gleich wie der OPERATE Schalter auf dem Videorecorder (schaltet die Stromversorgung ein/aus).

② **Uhrzeit/Timer-Display:** Beim Einstellen von Uhrzeit und Timerdaten zeigt dieses Feld die eingegebenen Werte und die nachfolgenden Schritte an. Nach dem Einstellen wird die Uhrzeit angezeigt.

③ **Zeituhr/Timer-Programmiertasten:** Siehe ergänzende Anleitung für vollständigige Informationen.

④ **PROG MEMO:** Drücken, um den programmierten Inhalt in dem Speicher der Fernbedienung zu speichern, nachdem der Timer programmiert wurde. Bis zu 4 Programme können gespeichert werden. Siehe ergänzende Anleitung für vollständige Informationen.

⑤ **COUNT/REMAIN:** Drücken, um von der Uhrzeitanzeige auf die Bandzählwerksanzeige oder die Restbandanzeige umzuschalten. Siehe Seite 43 für Einzelheiten.

⑥ **TV PROGRAMME:** Gleich wie die TV PROG Taste auf dem Videorecorder (Wahl der nächst höheren oder niedrigeren Fernsehstation).

⑦ **REC:** Beide Tasten drücken, um mit der Aufnahme zu beginnen.

⑧ **PLAY/STOP/REW/F.FWD:** Gleich wie auf dem Videorecorder.

⑨ **STILL/PAUSE:** Gleich wie PAUSE auf dem Videorecorder (stoppt das Band vorübergehend).

⑩ **TRACKING:** Minimiert das Rauschen im Bild während der Wiedergabe und/oder Zeitlupen-Wiedergabe.

⑪ **INDEX:** Dient für die INDEX Funktion. Siehe Seite 45 für vollständige Informationen.

⑫ **REPEAT:** Für die Wiederholungsfunktion. Für Einzelheiten siehe Seite 44.

⑬ **PICTURE CONTROL (SLOW SPEED):** Diese Tasten dienen als PICTURE CONTROL Tasten während der Wiedergabe und als SLOW SPEED Tasten während des Zeitlupenmodus. Diese Tasten während der Wiedergabe drücken, um das Bild ablesefreundlich einzustellen. Diese Tasten während des Zeitlupenmodus drücken, um die Zeitlupengeschwindigkeit einzustellen.

⑭ **SLOW:** Dient für Zeitlupen-Wiedergabe.

⑮ **F.ADV/SKIP:** Dient für das Weiterschalten des Bildes während der Standbildwiedergabe. Für Einzelheiten siehe Seite 44.
Wire die F.ADV Taste während der normalen Wiedergabe gedrückt, dann wird das Band um eine Spieldauer von etwa 30 Sekunden vorgespult.

⑯ **COUNTER RESET:** Gleich wie 0000/E240 auf dem Videorecorder. (Stellt das Bandzählwerk auf "0000" zurück oder berechnet die Restspieldauer einer E240 Cassette.

⑰ **COUNTER MEMO:** Schaltet die Zählwerk-Speicherfunktion ein und aus.

⑱ **OSD MENU und DISP:** Dient für die Steuerung des Bildschirmdialogs (OSD-Funktion).

⑲ **Zehnertastatur**
- Zwei Nummern drücken, um eine Fernsehstation anzuwählen.
- Dient auch für das Einstellen der Uhrzeit und das Programmieren des Timers.

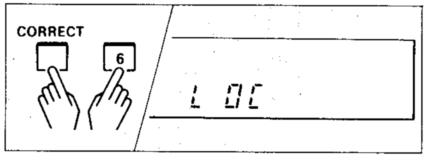
⑳ **VTR 1/VTR 2:** Wählt den Videorecorder für die Fernbedienung bei Verwendung von zwei Videorecordern an.

㉑ **Übertragungsfenster:** Überträgt die Befehle an den Videorecorder.

Hinweis: Infrarotstrahlen werden von Wänden reflektiert und erreichen somit den Empfänger im Videorecorder; für beste Ergebnisse sollten die Strahlen jedoch direkt auf den Empfänger übertragen werden.

Modusverriegelungsfunktion

Wenn Sie den derzeitigen Modus des Videorecorders, wie z.B. Aufnahme, Wiedergabe usw., verriegeln möchten, die CORRECT Taste und die Zifferntaste 6 der Fernbedienung gleichzeitig drücken. Wenn der Modus verriegelt ist, erscheint ''LOC'' in dem Videorecorder-Display und ''( )'' wird auf dem Bildschirm des Fernsehers angezeigt.



Während der Modus-Verriegelung, kann der Videorecorder über die Tasten der Fernbedienung nicht aber über die Tasten an der Frontplatte des Videorecorders gesteuert werden.
Um die Modusverriegelung freizugeben, die CORRECT Taste und die Taste 6 nochmals gleichzeitig drücken oder die OPERATE Taste auf der Fernbedienung betätigen.

Ausschalt-Automatikfunktion

Falls Sie mit Hilfe der TV PROG Taste ein Fernsehprogramm empfangen oder aufnehmen, dann wird die Stromversorgung des Videorecorders automatisch 8 Minuten nach Beendigung des Programms ausgeschaltet. Wenn jedoch ''AU'' in der Fernsehstation-Nummernanzeige des Videorecorders angezeigt wird, dann arbeitet diese Funktion nicht.

Rücklaufautomatik

Wenn das Bandende erreicht wird, sorgt der Videorecorder dafür, daß das Band automatisch zurückgespult wird.
Hinweis: Um ungewolltes Löschen zu vermeiden, spult der Videorecorder das Band nach der Timer-Aufnahme nicht automatisch zurück.

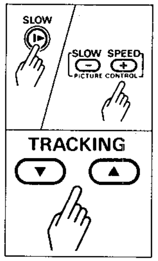
Rücklauf-Abschaltautomatik

Wird der Betriebsschalter während der Rücklauffunktion betätigt, dann wird das Band vollständig zurückgespult, worauf die Stromversorgung automatisch abgeschaltet wird.
Hinweis: Bei aktivierter Bandzählwerkspeicherfunktion Indexfunktion gibt der Videorecorder die Rücklauffunktion frei und schaltet das Bandlaufwerk ab, sobald die markierte Bandstelle erreicht ist.

SC-Anzeige

Wenn Sie mit der Fernbedienung die Fernsehstation 90 (Tasten 9 und 0 drücken) anwählen, dann leuchtet die SC-Anzeige in dem Display des Videorecorders auf. Während die SC-Anzeige aufleuchtet, können Sie die Videosignale vom Tuner des Videorecorders und die Audiosignale von der EURO-Buchse auf der Rückseite des Videorecorders aufnehmen.

Zeitlupe



Die SLOW Taste auf der Fernbedienung während der Wiedergabe drücken, um langsame Wiedergabe (Zeitlupe) zu erhalten. Dann die SLOW SPEED-Tasten auf der Fernbedieneinheit betätigen, um die Wiedergabegeschwindigkeit zu variieren.

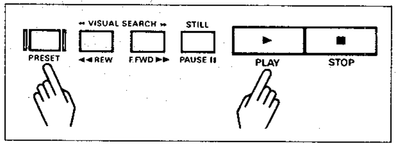
Hinweise:
- Kommt es während der Zeitlupen-Wiedergabe zu Rauschstörungen im Bild, dann sind diese durch Betätigung der Tasten für Spurlage (auf der Fernbedienung) zu eliminieren. Durch diese Einstellung während der Zeitlupen-Wiedergabe, werden Rauschstörungen auch während der Standbildfunktion vermieden.
- Verbleibt der Videorecorder für etwa 5 Minuten auf Zeitlupe geschaltet, dann schaltet das Bandlaufwerk automatisch auf die normale Wiedergabefunktion um.

Demonstration der OSD-Effekte

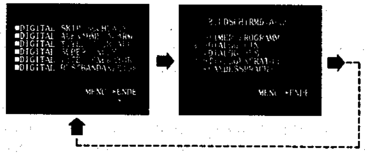
Sie können die in diesem Videorecorder verwendeten OSD-Effekte demonstrieren.

1 Darauf achten, daß keine Cassette in den Videorecorder eingesetzt ist.

2 Die PRESET Taste und die PLAY Taste gleichzeitig drücken, während Sie das mit Hilfe der TV PROGRAMME Taste an dem videorecorder eingestellte Programm empfangen.

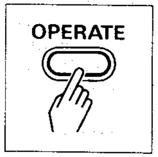


- Die Bilder, die die OSD-Effekte demonstrieren, werden jeweils für etwa 20 Sekunden angezeigt.



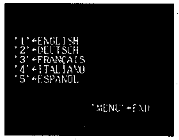
Hinweis: Wenn Sie gemäß der auf der nächsten Seite beschriebenen Vorgänge Deutsch wählen, dann werden die OSD-Effekte (Bildschirmdialog) in Deutsch demonstriert.

3 Um die Demonstration zu stoppen, die OPERATE Taste auf der Fernbedienung oder dem Videorecorder drücken.



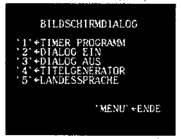
OSD (On Screen Display)

Die MENU Taste drücken, um die verschiedenen Anzeigen auf dem Bildschirm des Fernsehers anzuzeigen. Wenn die MENU Taste gedrückt wird, erscheint die folgende Anzeige auf dem Bildschirm des Fernsehers.



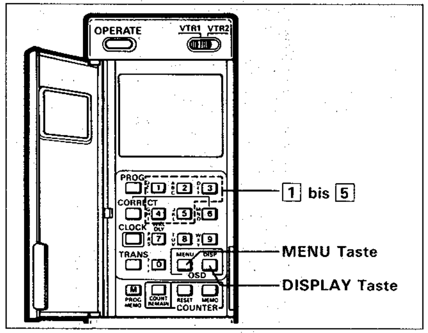
'1' ←ENGLISH
'2' ←DEUTSCH
'3' ←FRANÇAIS
'4' ←ITALIANO
'5' ←ESPANOL
'MENU' ←END

Die auf dem Bildschirm des Fernsehers anzuzeigende Landessprache wählen. Wenn Sie die Taste 1 auf der Fernbedienung drücken, um z.B. Englisch zu wählen, dann erscheint der Bildschirmdialog (OSD MENU) in Englisch.
Mit dem Drücken der Taste 2 wird Deutsch für den Bildschirmdialog gewählt. Nebenstehend ist ein Beispiel dargestellt, bei dem Deutsch durch Drücken der Taste 2 gewählt wurde.



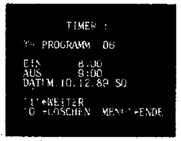
BILDSCHIRMDIALOG
'1' ←TIMER PROGRAMM
'2' ←DIALOG EIN
'3' ←DIALOG AUS
'4' ←TITELGENERATOR
'5' ←LANDESSPRACHE
'MENU' ←ENDE

Der Bildschirmdialog (OSD MENU) erscheint. Eine der Tasten 1 – 5 drücken, um die gewünschte Anzeige anzuwählen.



■ **Kontrolle (Durchsicht) der Programminformationen**

- Die 1 Taste drücken. Auf dem Bildschirm werden nun die Informationen angezeigt, die Sie für die niedrigste Timer-Programmnummer eingegeben haben.

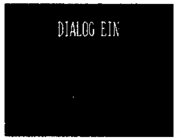


TIMER :
PROGRAMM 06
EIN 8:00
AUS 9:00
DATUM 10.12.89 SO
'1' ←WEITER
'0' ←LÖSCHEN 'MENU' ←ENDE

- Die 1 Taste nochmals drücken, wenn Sie die nächsten Programminformationen durchsehen möchten. Durch Drücken der 0 Taste wird das Programm gelöscht.
- Die MENU Taste drücken, um auf das ursprüngliche Bild zurückzukehren.

■ **OSD ON**

- Die 2 Taste drücken. Die OSD-Funktion wird eingeschaltet und ''OSD ON'' (DIALOG EIN) wird auf dem Bildschirm des Fernsehers angezeigt. Diese Anzeige verschwindet nach etwa 8 Sekunden.



DIALOG EIN

Hinweise:
- Wenn Sie den Modus ändern, wird der neue Modus automatisch für einige Sekunden am Bildschirm des Fernsehers angezeigt.
- Wenn Sie von dem Videorecorder-Modus auf das OSD-Menü (Bildschirmdialog) wechseln möchten, die MENU Taste zweimal drücken.
- Wird die DISPLAY Taste bei eingeschalteter OSD-Funktion gedrückt, dann wird folgendes erhalten.
  1. Drücken .... Aufruf der Modusanzeige auf dem Bildschirm des Fernsehers.
  2. Drücken (bevor die Anzeige verschwindet) .... Die Anzeige verschwindet, ausgenommen Bandzählwerk (Restbandzeit) und Datum/Uhrzeit.
  3. Drücken .... Die Anzeige wird gelöscht.

■ **OSD OFF**

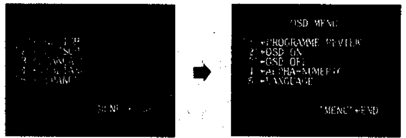
- Die 3 Taste drücken. Die OSD-Funktion (Bildschirmdialog) wird ausgeschaltet und nichts wird auf dem Bildschirm des Fernsehers angezeigt, auch wenn die DISPLAY Taste gedrückt wird. In diesem Status wird der Betriebsmodus des Videorecorders nicht auf dem Bildschirm des Fernsehers angezeigt. Dieser Modus ist zu verwenden, um Aufnahme der OSD-Anzeige zu verhindern.

■ **Alphanumerische Anzeige**

Siehe nächste Seite.

■ **Wahl der Sprache**

Sie können die Sprache für die Anzeige auf dem Bildschirm des Fernsehers wählen.
- Die 5 Taste drücken. Die 5 Sprachen werden auf dem Bildschirm des Fernsehers angezeigt; danach eine der Tasten 1 – 5 drücken, um die gewünschte Sprache zu wählen.

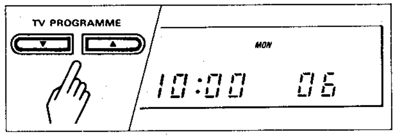


- Wenn z.B. die 1 Taste gedrückt wird, erscheint das OSD-Menü in Englisch. Danach erfolgt die Modusanzeige in Englisch, wenn Sie den Videorecorder betätigen.

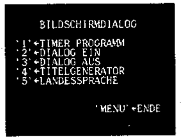
■ **Alphanumerische Anzeige**

Sie können einfach persönliche Titel erstellen und diese auf Ihren Video-Cassetten aufzeichnen.

1 Die TV PROGRAMME Taste (▼ oder ▲) auf der Fernbedienung drücken, um das Bild zu wählen, mit dem der Titel aufgenommen werden soll.



2 Die MENU Taste drücken. Die Anzeige erscheint auf dem Bildschirm des Fernsehers.


BILDSCHIRMDIALOG

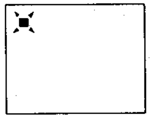
'1'←TIMER PROGRAMM
'2'←DIALOG EIN
'3'←DIALOG AUS
'4'←TITELGENERATOR
'5'←LANDESSPRACHE

'MENU'←ENDE

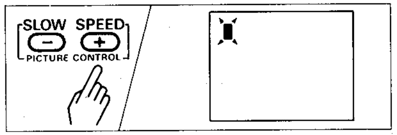
Hinweise:

- Wenn der Videorecorder-Modus auf dem Bildschirm des Fernsehers angezeigt wird, die MENU Taste zweimal drücken.
- Falls Sie auf der vorhergehenden Seite eine andere Sprache als Englisch angewählt haben, dann wird das OSD-Menü (Bildschirmdialog) in der gewählten Sprache angezeigt.

3 Die [4] Taste drücken. Der blinkende Cursor erscheint auf dem Bildschirm des Fernsehers.



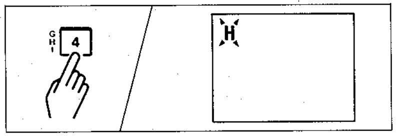
4 Die Zeichengröße durch Drücken der SLOW SPEED (+) Taste wählen.



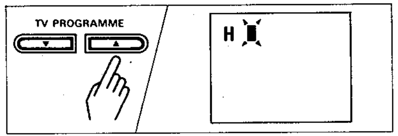
- Die Zeichen können vertikal in 4 Schritten vergrößert werden (eine Vergrößerung in horizontaler Richtung ist nicht möglich).

5 Die Tasten [0] – [9] drücken, um das einzugebende Zeichen zu wählen.

- Mit jeder Betätigung der [4] Taste wechseln z.B. die Zeichen in der Reihenfolge 4, G, H, I und zurück auf 4.



6 Die TV PROGRAMME (▲) Taste auf der Fernbedienung drücken, um den Cursor um eine Stelle vorzustellen.

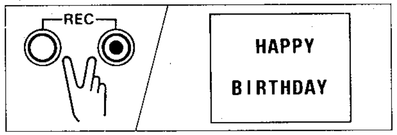


Hinweis: Falls Ihnen bei der Eingabe der Zeichen ein Fehler unterläuft, die TV PROGRAMME Taste (▼) auf der Fernbedienung drücken, um den Cursor zurückzustellen, und das richtige Zeichen eingeben.

7 Die Schritte 5 und 6 wiederholen, um den gewünschten Titel zu erstellen.

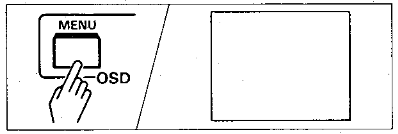
HAPPY
BIRTHDAY

8 Die REC Taste drücken, um diesen Titel mit dem Bild im Hintergrund aufzunehmen.



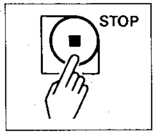
- Der Titel wird gemeinsam mit dem Bild aufgenommen.

9 Die MENU Taste drücken.



- Der Titel verschwindet von dem Bildschirm, die Aufnahme wird aber fortgesetzt.

10 Die STOP Taste drücken, um die Aufnahme zu beenden.



Hinweise zur alphanumerischen Anzeige

- Einen Titel bei auf dem Stoppmodus geschaltetem Videorecorder zusammenstellen.
- Wenn ein blauer Hintergrund angezeigt wird, dann kann der Titel zwar angezeigt nicht aber aufgenommen werden.
- Alle Zeichen werden mit der gleichen Größe angezeigt. Einzelne Zeichen lassen sich also nicht vergrößern oder verkleinern.
- Mit der TV PROGRAMME Taste an dem Videorecorder läßt sich der Cursor nicht verschieben.
- Die folgenden Zeichen werden durch Drücken der Tasten [0] bis [9] ausgewählt.

[0]	0	?	!	'
[1]	1	Q	Z	.
[2]	2	A	B	C
[3]	3	D	E	F
[4]	4	G	H	I

[5]	5	J	K	L
[6]	6	M	N	O
[7]	7	P	R	S
[8]	8	T	U	V
[9]	9	W	X	Y

- Nach der Zusammenstellung eines Titels kann dieser durch Drücken der SLOW SPEED (+) Taste vergrößert werden. Den Titel jedoch nicht übermäßig vergrößern, da dieser sonst über die Kanten des Bildschirms hinaus geht.
- Nachdem ein Titel erstellt wurde, kann dieser nicht nach links oder rechts bzw. nach oben oder unten verschoben werden.
- Wenn Sie die TV PROGRAMME (▲) Taste nach der Erstellung eines Titels drücken, dann erscheint ein blinkender Cursor. In diesem Status sollte keine Aufnahme durchgeführt werden, da anderenfalls der blinkende Cursor mit aufgezeichnet wird.
- Die Zeichen erscheinen mit schwarzer Umrandung, wenn der Titel zusammengestellt wird; dieser schwarze Rahmen verschwindet, wenn der Titel aufgezeichnet wird.

TIMER-AUFNAHME

Der programmierbare elektronische Timer gestattet unbeaufsichtigte Aufnahmen von bis zu 8 vorgegebenen Programmen bis zu einem Jahr im voraus, einschließlich der täglichen und wöchentlichen Aufnahme des gleichen Programms (der gleichen Programme). Der Timer sorgt danach automatisch für das Ein- und Ausschalten des Videorecorders und die Programmwahl.

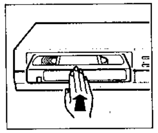
Der Timer kann mit Hilfe der mitgelieferten Fernbedienung progammiert werden. Siehe die ergänzende Anleitung für Einzelheiten über die Programmiervorgänge der Fernbedienung. Sie müssen die Uhrzeit im Videorecorder richtig einstellen, bevor der Timer programmiert wird. Auch das Einstellen der Uhr ist der ergänzenden Anleitung zu entnehmen.

Vorbereitungen für Timer-Aufnahme

- Für Timer-Aufnahme muß Ihr Fernsehempfänger nicht eingeschaltet werden, da der Videorecorder mit einem Video-Tuner ausgerüstet ist. Der Fernsehempfänger wird also nur für die Kontrolle, Wiedergabe bzw. für den direkten Fernsehempfang benötigt.

1 Darauf achten, daß die Zeituhr richtig auf die Tageszeit und den Wochentag eingestellt ist.

2 Eine Cassette einschieben. Darauf achten, daß die Löschschutzlamelle der Cassette intakt ist, da anderenfalls Aufnahmen nicht möglich sind.



3 Timer gemäß nachfolgender Beschreibung programmieren. Für Einzelheiten siehe ergänzende Anleitung.
Hinweis: Wenn Sie den Fernseher einschalten und den Video-Kanal auf dem Fernseher wählen, dann werden die programmierten Informationen ebenfalls auf dem Bildschirm des Fernsehers angezeigt, wenn sie an den Videorecorder übertragen werden. Die Anzeigen "FULL", "ERR" usw. werden sowohl auf dem Bildschirm des Fernsehers als auch auf dem Display des Videorecorders angezeigt.

4 Den OPERATE Schalter ausschalten. Falls eine Cassette mit ausgebrochener Löschschutzlamelle eingesetzt ist, dann wird diese mit dem Ausschalten der Stromversorgung automatisch ausgeworfen. Wenn Sie den Fernseher bereits eingeschaltet und den Video-Kanal gewählt haben, dann erscheint eine Alarm-Anzeige auf dem Bildschirm des Fernsehers.

DEMONTAGE

1. Identifikation und Anordnung der Leiterplatten

(Für Einzelheiten über den Ausbau der folgenden Leiterplatten siehe Seite 2-4).)

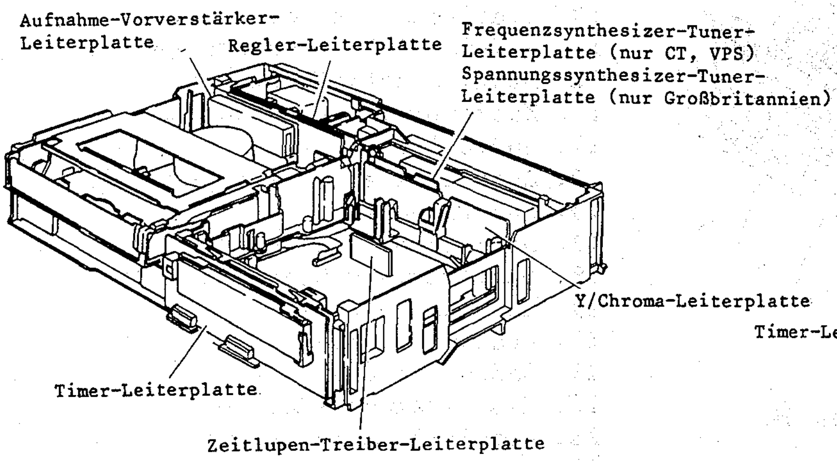

Aufnahme-Vorverstärker-Leiterplatte
Regler-Leiterplatte
Frequenzsynthesizer-Tuner-Leiterplatte (nur CT, VPS)
Spannungssynthesizer-Tuner-Leiterplatte (nur Großbritannien)
Y/Chroma-Leiterplatte
Timer-Leiterplatte
Zeitlupen-Treiber-Leiterplatte

Abb. 1-1 Draufsicht

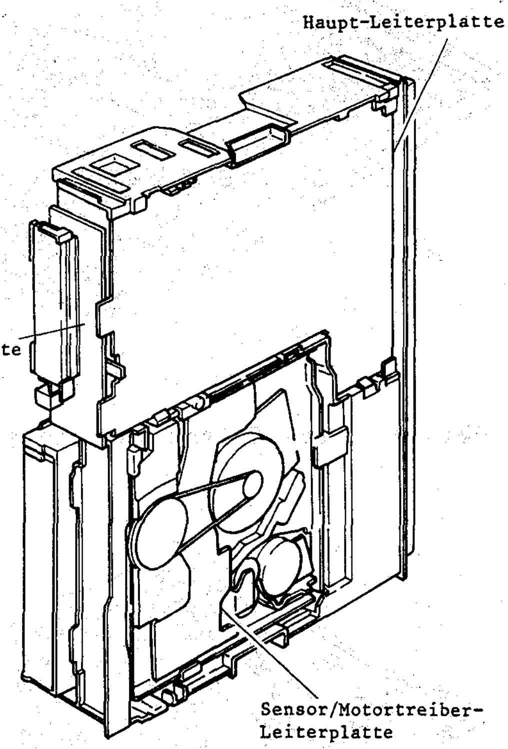
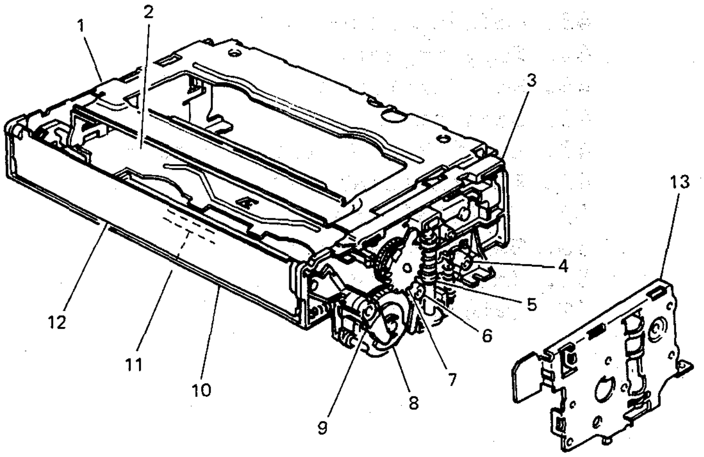

Haupt-Leiterplatte
Timer-Leiterplatte
Sensor/Motortreiber-Leiterplatte

Abb. 1-2 Bodenansicht

2. Identifikation und Anordnung der mechanischen Hauptteile

(Für Einzelheiten über den Ausbau der folgenden Komponenten siehe Seite 2-5.)


1
2
3
4
5
6
7
8
9
10
11
12
13

1. Chassishalter
2. Kassettenhalter
3. Getriebehalterung
4. Schalthebel B
5. FL-Schnecke
6. Schalthebel A
7. Schneckenrad
8. Antriebszahnrad
9. Türarm
10. Fronthalter
11. Wellenstift
12. Kassetteneinschubklappe
13. Seitenchassis

Abb. 2-1 Kassetten-Lademechanismus

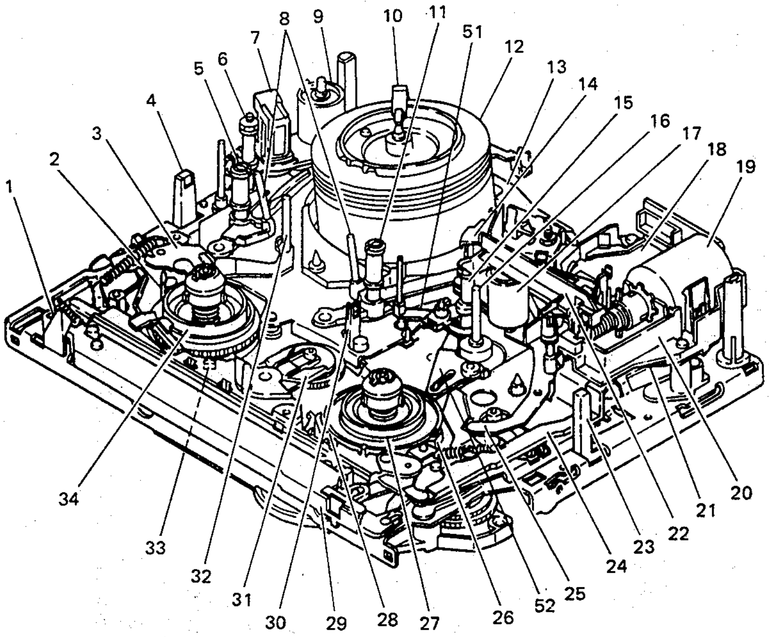


Abb. 2-2 Draufsicht auf das Bandlaufwerk

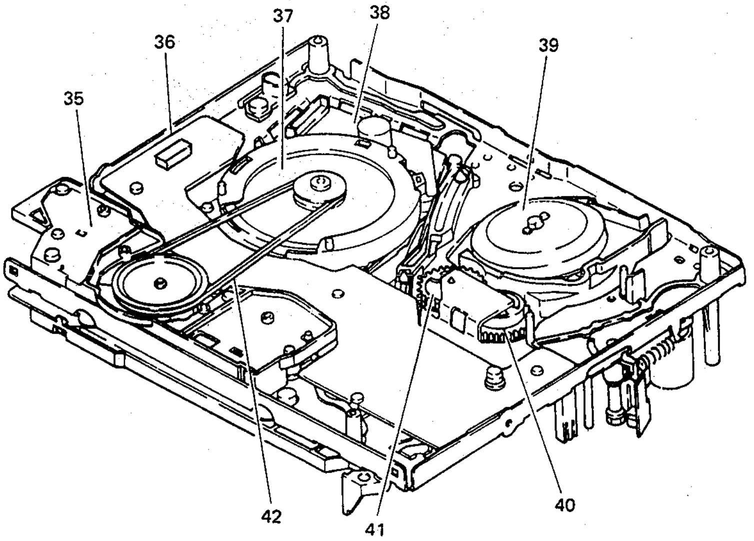


Abb. 2-3 Bodenansicht des Bandlaufwerks

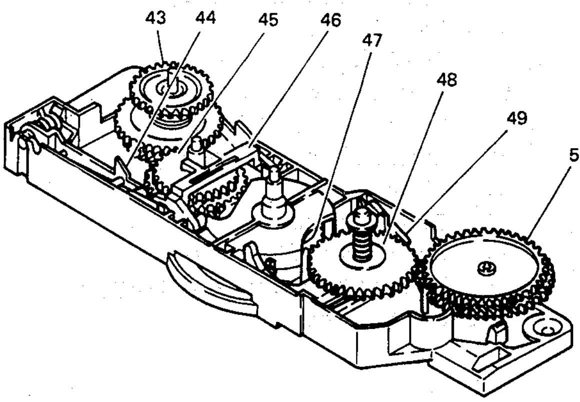


Abb. 2-4 Kupplungsgrundplatte

1. Sicherheitsarm
2. Spannbandeinheit
3. Spannarm
4. Vorratstellersensor
5. Vorratsteller-Führungsrolle
6. Vorratsteller-Führungsstift
7. Gesamtlöschkopf
8. Winkelstift
9. Zwischenrolle
10. Statische Entladebürste
11. Aufwickelteller-Führungsrolle
12. Kopftrommelmotoreinheit
13. Kopftrommel-Grundplatte
14. Audio/Synchronkopf
15. Aufwickelteller-Führungsstift
16. Capstanwelle
17. Andruckrolleneinheit
18. Bandlaufwerk-Statusschalter
19. Lademotoreinheit
20. Lademotorhalter
21. Ladehalterung
22. Kassettendeckelöffner
23. Aufwickeltellersensor
24. Bremsgestängearm
25. Andruckrollen-Betätigungsarm
26. Aufwickelteller-Bremseinheit
27. Aufwickeltellertisch
28. Aufwickelteller-Hauptbremse
29. Gleitblockeinheit
30. Endlampe
31. Tellerantriebs-Zwischenzahnrad
32. Spannstift
33. Vorratsteller-Hauptbremse
34. Vorratstellertisch
35. Kupplungsgrundplatteneinheit
36. Sensor/Motortreiber-Leiterplatte
37. Capstanmotor
38. Capstanmotor-Leiterplatte
39. Kopftrommelmotoreinheit
40. Vorratsladezahnrad
41. Aufwickelladezahnrad
42. Tellerriemen
43. Aufwickelzahnrad
44. Kupplungsarm
45. Schaltzahnrad
46. Schaltarm
47. Aufwickel-Riemenscheibe
48. FL-Schaltzahnrad
49. FL-Schaltarm
50. Zwischenzahnrad
51. Halbladearm
52. Zwischenarm

3. Ausbau des Gehäuses

1. Obere Abdeckung, Bodenplatte, Frontplatte und Klappe zum zweiten Reglerfeld

Obere Abdeckung
1) Drei (3) Schrauben entfernen. Die Rückseite der oberen Abdeckung anheben und die gesamte Abdeckung nach hinten schieben.

Bodenplatte
2) Sieben (7) Schrauben entfernen, mit welchen die Bodenplatte befestigt ist.

Frontplatte
3) Zwei (2) Schrauben entfernen und fünf (5) Anschläge freigeben. Die oberseite der Platte nach vorne kippen und drei (3) Anschläge an der Unterseite der Platte freigeben; danach die Frontplatte herausziehen.

Klappe zum zweiten Reglerfeld
4) Die Klappe zum zweiten Reglerfeld öffnen; die Befestigungsabschnitte niederdrücken und dabei die Klappe in Pfeilrichtung ziehen, um zwei (2) Scharnierteile freizugeben.

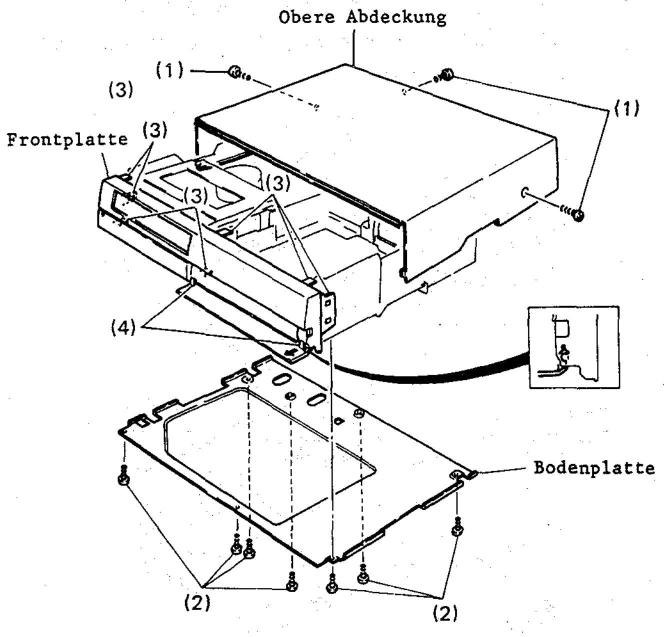


Abb. 3-1 Obere Abdeckung, Bodenplatte, Frontplatte und Klappe zum zweiten Reglerfeld

2. Rückwand (Abb. 3-2)

1) Die obere Abdeckung, die Bodenplatte und die Frontplatte ausbauen (siehe Punkt 1).
2) Die Haupt-Leiterplatte ausbauen. (Siehe Punkt 3 im Abschnitt "Ausbau der Leiterplatten".)
3) Eine (1) Schraube entfernen.
4) Die Rückwand herausziehen, während zwei (2) Anschläge freigegeben werden, die den HF-Konverterabschnitt festhalten.

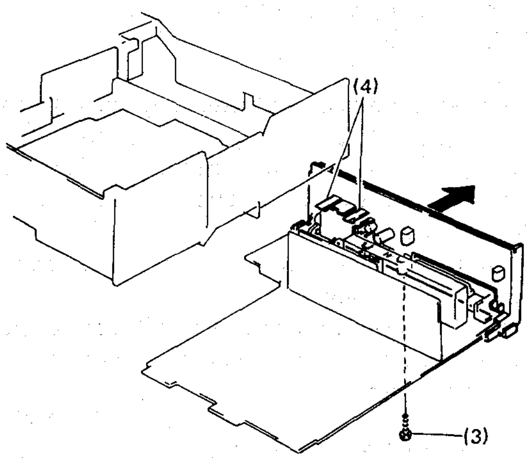


Abb. 3-2 Rückwand

3. Fernbedienung (Abb. 3-3)

1) Den Batteriefachdeckel abnehmen.
2) Zwei (2) Schrauben aus dem Batteriefach entfernen.
3) Acht (8) Laschen freigeben.

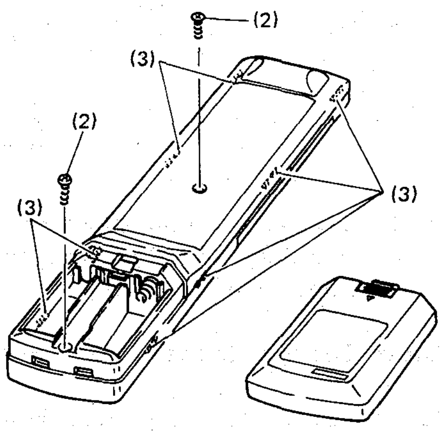


Abb. 3-3 Fernbedienung

4. Ausbau der Leiterplatten

1. Y/Chroma- und Frequenzsynthesizer/ Spannungssynthesizer-Tunur-Leiterplatten (Abb. 4-1)

Y/Chroma-Leiterplatte

1) Eine (1) Schraube entfernen, mit welcher der Leiterplattenhalter befestigt ist.
2) Die Y/Chroma-Leiterplatte herausziehen.

Frequenzsynthesizer/Spannungssynthesizer-Tuner-Leiterplatte

3) Eine (1) Schraube entfernen und den Abschirmdeckel anheben (nur VT-M630E).
4) Den Leiterplattenhalter entfernen (nur VT-M640E).
5) Die Frequenzsynthesizer/Spannungssynthesizer-Tuner-Leiterplatte herausziehen.

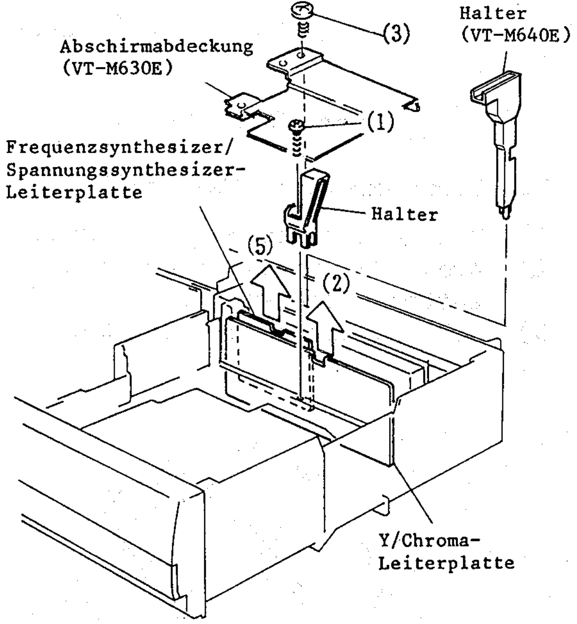

(3)
Halter
(VT-M640E)
Abschirmabdeckung
(VT-M630E)
(1)
Frequenzsynthesizer/
Spannungssynthesizer-
Leiterplatte
Halter
(5)
(2)
Y/Chroma-
Leiterplatte

Abb. 4-1 Y/Chroma- und Frequenzsynthesizer/Spannungssynthesizer-Tuner-Leiterplatten

2. Timer-Leiterplatte (Abb. 4-2)

1) Die obere Abdeckung, die Bodenplatte und die Frontplatte ausbauen (siehe Punkt 1 unter "Ausbau des Gehäuses").
2) Zwei (2) Anschläge freigeben und die Timer-Leiterplatte nach vorne neigen, wie es durch die Pfeilmarkierung angegeben ist.
3) Zwei (2) Stecker von der Haupt-Leiterplatte abtrennen.

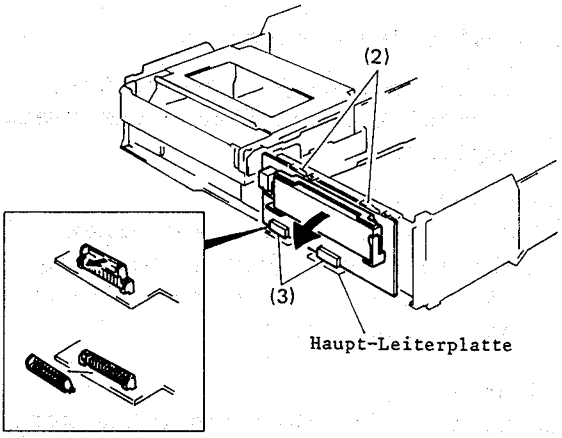

(2)
(3)
Haupt-Leiterplatte

Abb. 4-2 Timer-Leiterplatte

3. Haupt- und Zeitlupen-Treiber-Leiterplatten (Abb. 4-3)

1) Die obere Abdeckung, die Bodenplatte und die Frontplatte ausbauen (siehe Punkt 1 unter "Ausbau des Gehäuses").
2) Die Y/Chroma- und Frequenzsynthesizer/Spannungssynthesizer-Tuner-Leiterplatten ausbauen (siehe Punkt 1)
3) Die Timer-Leiterplatte ausbauen (siehe Punkt 2).
4) Vier (4) Stecker und ein (1) Flachkabel abtrennen.
5) Fünf (5) Anschläge freigeben.
6) Die Zeitlupen-Treiber-Leiterplatte herausziehen.

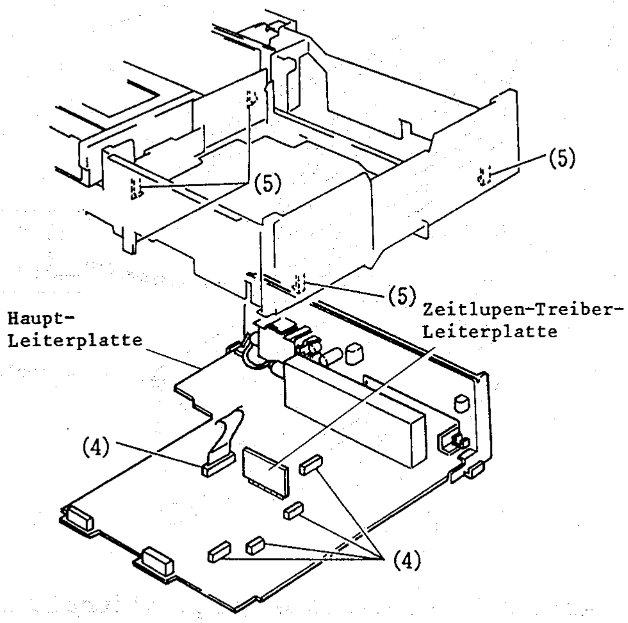

(5)
(5)
(5)
Haupt-
Leiterplatte
Zeitlupen-Treiber-
Leiterplatte
(4)
(4)

Abb. 4-3 Haupt- und Zeitlupen-Treiber-Leiterplatten

4. Regler-Leiterplatte (Abb. 4-4)

1) Die obere Abdeckung ausbauen (siehe Punkt 1 unter "Ausbau des Gehäuses").

2) Eine (1) Schraube von der Bodenplatte entfernen.
3) Drei (3) Schrauben entfernen.
4) Zwei (2) Stecker abtrennen.

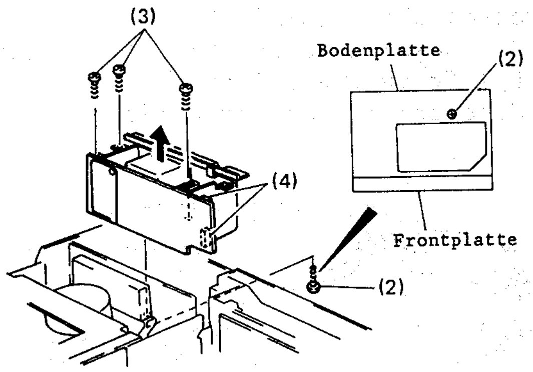


Abb. 4-4 Regler-Leiterplatte

5. Aufnahme-Vorverstärker-Leiterplatte (Abb. 4-5)

1) Die obere Abdeckung ausbauen (siehe Punkt 1 unter "Ausbau des Gehäuses").
2) Stecker (2) abtrennen.
3) Zwei (2) Schrauben entfernen und die Aufnahme-Vorverstärker-Leiterplatte herausziehen.

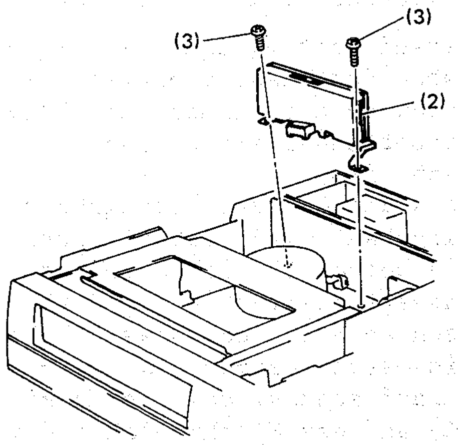


Abb. 4-5 Aufnahme-Vorverstärker-Leiterplatte

6. Sensor/Motortreiber-Leiterplatte (Abb. 4-6)

1) Die Bodenplatte ausbauen (siehe Punkt 1 unter "Ausbau des Gehäuses").
2) Ein (1) Flachkabel abtrennen.
3) Zwei (2) Stecker abtrennen.
4) Den Wickelteller-Antriebsriemen abnehmen.
5) Vier (4) Schrauben entfernen und die Sensor/Motortreiber-Leiterplatte anheben.

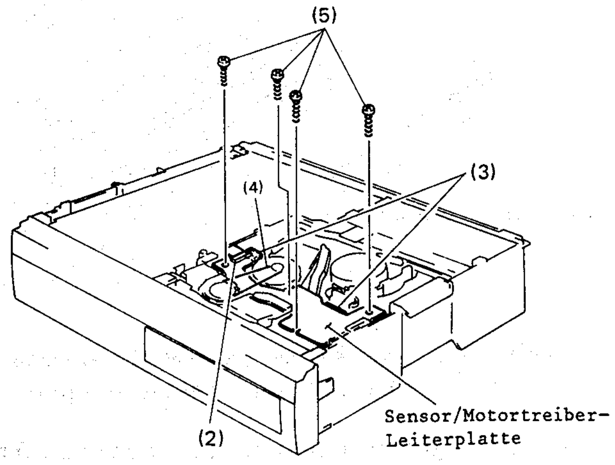


Abb. 4-6 Sensor/Motottreiber-Leiterplatte

5. Ausbau des Kassettenlademechanismus

1. Kassettenlademechanismus und Kassetteneinschubklappe
* Die nachfolgend aufgeführten Komponenten werden unter der Annahme beschrieben, daß die obere Abdeckung, die Bodenplatte, die Frontplatte und der Kassettenlademechanismus bereits ausgebaut wurden. (Siehe Punkt 1 unter "Ausbau des Gehäuses" und Punkt 1 unter "Ausbau des Kassettenlademechanismus".)
2. Ladezahnradeinheit, Chassishalter, Kassettenhaltereinheit und Fronthalter
3. Kassettenhalter-Grundplatte und Kassettenhalter (L/R)

1. Kassettenlademechanismus und Kassetteneinschubklappe (Abb. 5-1)

Cassettenlademechanismus
1) Die obere Abdeckung und die Frontplatte ausbauen (siehe Punkt 1 unter "Ausbau des Gehäuses").
2) Zwei (2) Schrauben entfernen.
3) Den Kassettenlademechanismus an der Rückseite anheben und die Befestigungen an der vorderen Unterseite freigeben.

Kassetteneinschubklappe
4) Die linke Seite des vorderen Halters in Pfeilrichtung nach außen drücken und die Kassetteneinschubklappe abnehmen.

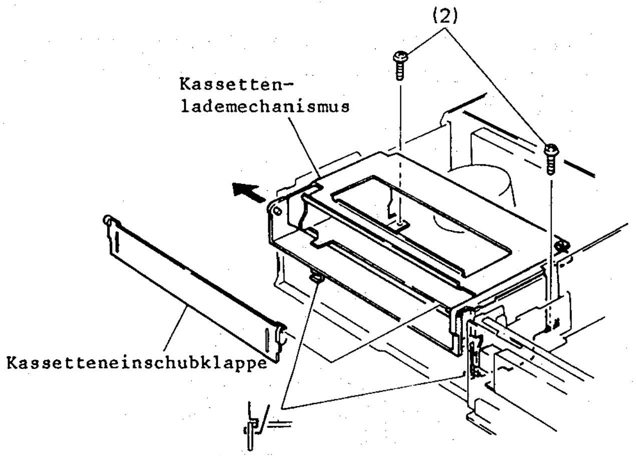

(2)
Kassetten-
lademechanismus
Kasseteneinschubklappe

Abb. 5-1 Kassettenlademechanismus und Kasseteneinschubklappe

2. Ladegetriebeeinheit, Chassishalter, Kassettenhaltereinheit und Fronthalter

Ladegetriebeeinheit (Abb. 5-2)

1) Zwei (2) Laschen (im Eingriff mit dem Chassishalter) und eine (1) Lasche (im Eingriff mit dem Fronthalter) freigeben und danach die Ladegetriebeeinheit abtrennen.

Chassishalter

2) Zwei (2) Laschen freigeben, die in den Fronthalter eingreifen.

Kassettenhaltereinheit

3) Das Antriebsgetriebe abnehmen und die Kassettenhaltereinheit entfernen.

Fronthalter

4) Den Wellenstift und den Antriebsarm L entfernen.

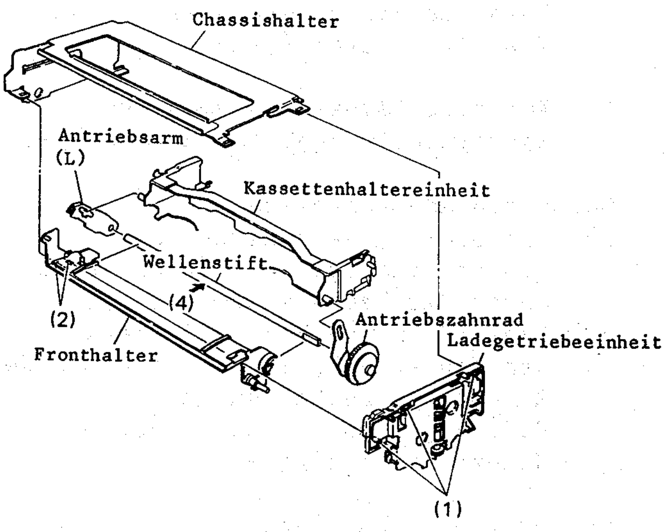

Chassishalter
Antriebsarm
(L)
Kassettenhaltereinheit
Wellenstift
(4)
(2)
Antriebszahnrad
Ladegetriebeeinheit
Fronthalter
(1)

Abb. 5-2 Ladegetriebeeinheit, Chassishalter, Kassettenhaltereinheit und Fronthalter

3. Kassettenhalter-Grundplatte und Kassettenhalter (L/R) (Abb. 5-3)

Kassettenhalter-Grundplatte

1) Vier (4) Laschen an den L/R Kassettenhaltern freigeben.

Kassettenhalter (L/R)

2) Die Laschen an den Kassettenhaltern L/R freigeben und die Kassettenhalter herausziehen.

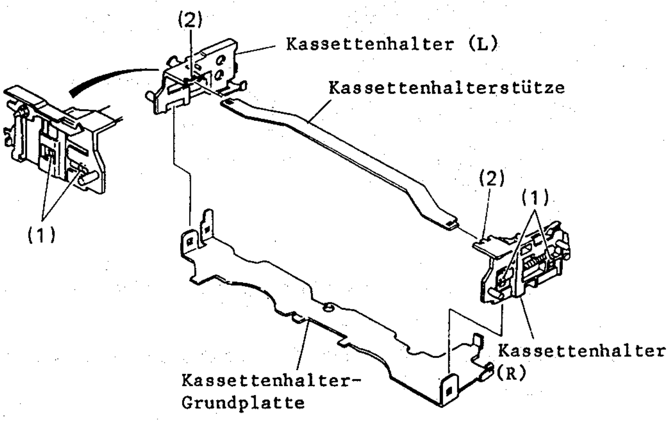

(2)
Kassettenhalter (L)
Kassettenhalterstütze
(2)
(1)
(1)
Kassettenhalter
(R)
Kassettenhalter-
Grundplatte

Abb. 5-3 Kassettenhalter-Grundplatte und Kassettenhalter (L/R)

(Vorsichtsmaßnahmen beim Einbau)
Die Komponenten durch sinngemäße Umkehr der Ausbauvorgänge einbauen, wobei auf die folgenden Punkte zu achten ist.

* Darauf achten, daß die beiden (2) Naben des Kassettenhalters in die Nuten an der linken Seite des Kassettenhalters eingesetzt werden. (Abb. 5-4)

* Wenn die Ladegetriebeeinheit eingebaut wird, darauf achten, daß die beiden (2) Naben an dem Kassettenhalter in die Nuten an der rechten Seite des Chassishalters eingesetzt werden. (Abb. 5-5)

* Darauf achten, daß die Markierung (△) auf dem Synchronzahnrad mit der Markierung (◊) an dem Kupplungs-Zahnrad ausgerichtet ist. (Abb. 5-5)

* Darauf achten, daß die Nabe des Kassettenschalterhebels (A) auf der Nocke des Synchronzahnrades angebracht ist.

* Wenn die Kasseteneinschubklappe wieder eingebaut wird, darauf achten, daß die Nabe des Klappenarmes in die Nut der Kasseteneinschubklappe eingesetzt wird.

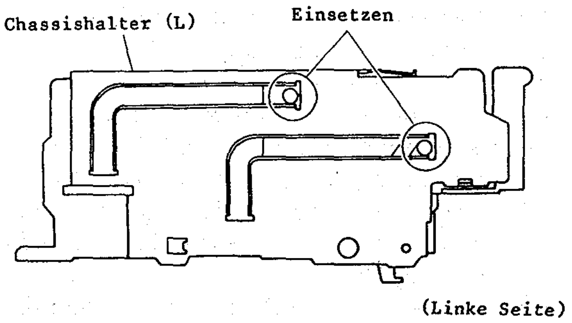

Chassishalter (L)
Einsetzen
(Linke Seite)

Abb. 5-4

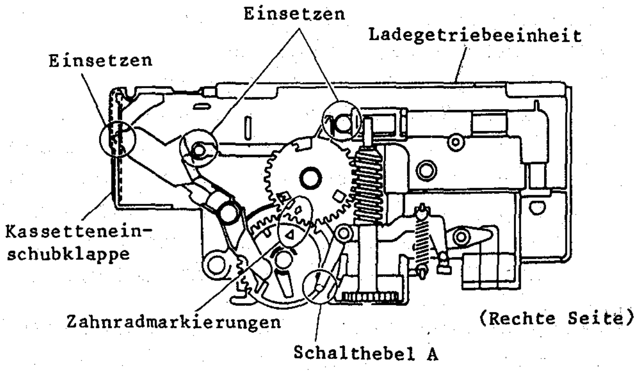

Einsetzen
Ladegetriebeeinheit
Einsetzen
Kassettenein-
schubklappe
Zahnradmarkierungen
(Rechte Seite)
Schalthebel A

Abb. 5-5

6. Ausbau des Ladezahnrades

Seiten-Chassis, FL-Schnecke, Türarm, Schneckenrad und Schalthebel A/B (Abb. 6-1)

Seiten-Chassis
1) Vier (4) Laschen freigeben, die in die Ladegetriebeeinheit eingreifen.

FL-Schnecke
2) Die FL-Schnecke herausziehen.

Türarm
3) Die Feder zwischen dem Türarm und der Getriebehalterung entfernen.
4) Den Türarm herausziehen.

Schneckenrad
5) Das Schneckenrad herausziehen.

Schalthebel A/B
6) Die Feder zwischen dem Schalthebel (A) und der Getriebehalterung entfernen.
7) Die Schalthebel (A) und (B) herausziehen.

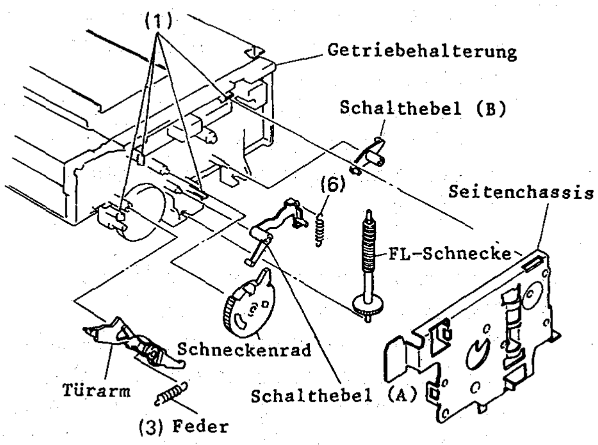

(1)
Getriebehalterung
Schalthebel (B)
(6)
Seitenchassis
FL-Schnecke
Schneckenrad
Türarm
Schalthebel (A)
(3) Feder

Abb. 6-1 Seiten-Chassis, FL-Schecke, Türarm, Schneckenrad und Schalthebel A/B

7. Ausbau der mechanischen Haupt-Komponenten

1. Köpfe
 * Obere Kopftrommel (Videoköpfe)
 * Zwischenrolle/Gesamtlöschkopf
 * Audio/Synchronkopf
2. Kopftrommelmotoreinheit
3. Capstanmotoreinheit
4. Lademotor, Bandlaufwerk-Statusschalter und Kondensatsensor
5. Spanarm, Spannband
6. Gleitblock, Tellerantriebzahnrad
7. Vorrats-/Aufwickelteller, Halbladearm und Zwischenarm
8. Rollen und Führungen
 * Andruckrolle
 * Vorratsteller-Führungsrolle
 * Aufwickelteller-Führungsrolle
 * Vorrats-/Aufwickelteller-Führungsrolle
9. Lademotoreinheit, Bremsgestängearm und FS-Bremsarm
10. Ladehalterungseinheit und Aufwickeltellerbremse
11. Bremsenbetätigungsarm, Modus-Zahnrad, Schneckenrad, Andruckrollen-Betätigungsarm, Modus-Schaltarm und Bremsenhubarm
12. Kopftrommelmotor-Grundplatte und Vorrats-/Aufwickelteller-Ladearme
13. Aufwickelteller-Riemenscheibe und Kupplungs-Getriebeeinheit
14. Aufwickelteller-Zahnrad, Schaltarm, Schaltzahnrad, FL-Schaltzahnrad und FL-Schalthebel

1. Köpfe

Obere Kopftrommel (Videoköpfe) (Abb. 7-1A)
1) Die obere Abdeckung entfernen (siehe Punkt 1 unter "Ausbau des Gehäuses").

2) Eine (1) Schraube entfernen, mit der die statische Entladebürste befestigt ist.
3) Zwei (2) Befestigungsschrauben der oberen Kopftrommel entfernen. Die obere Kopftrommel nach oben abziehen.

(Vorsicht während der Arbeiten)

- * Da die obere Kopftrommel mit Steckern versehen ist, niemals Druck in Drehrichtung ausüben. Die Kopftrommel vertikal nach oben abziehen, in Richtung der Montage.
- * Die Spitzen der Videoköpfe nicht mit den Fingern oder mit Werkzeugen berühren.

(Vorsicht während des Einbaus)

- * So einsetzen, daß der Pfeil auf dem Drehtransformator mit der blauen Seite des Videokopf-Steckers übereinstimmt.
- * Die beiden (2) Schrauben, mit welchen die obere Kopftrommel festgehalten wird, abwechselnd festziehen.

(Einstellungen nach dem Einbau)

- * Einstellungen nach dem Austausch der Kopftrommel

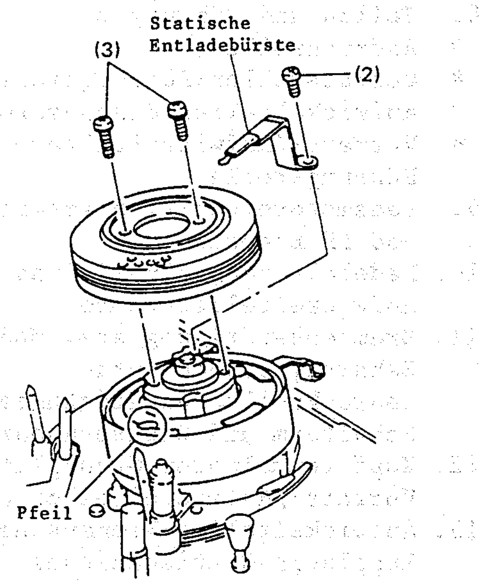

Statische Entladebürste
(3)
(2)
Pfeil

Abb. 7-1A Obere Kopftrommel (Videoköpfe)

Zwischenrolle/Gesamtlöschkopf (Abb. 7-1B)

1) Die obere Abdeckung entfernen (siehe Punkt 1 unter "Ausbau des Gehäuses").
2) Die Feder zwischen der Gesamtlöschkopf-Grundplatte und dem Chassis entfernen.
3) Den Stecker abtrennen.
4) Die Befestigungsmutter der Führungsrolle lösen und die Führungsrolle herausziehen.
5) Eine (1) Lasche freigeben und Zwischenrolle/Gesamtlöschkopf entfernen.
6) Um den Gesamtlöschkopf abzunehmen, zwei (2) Laschen freigeben und den Gesamtlöschkopf herausziehen.

Audio/Synchronkopf (Abb. 7-1B)

7) Einen Secker abziehen.
8) Die Befestigungsmutter der Kopfgrundplatte lösen und die Grundplatte nach oben herausziehen.
   - * Die unter Seite der Feder unter der Kopfgrundplatte an dem Chassis und das obere Ende an dem Anschlag an der Kopfgrundplatte einhängen.

(Vorsichtsmaßnahmen beim Wiedereinbau)

- * Darauf achten, daß der Federabschnitt der Audio/Synchronkopf-Befestigungsschraube 6,3 mm über die Grundplatte (1) übersteht.
- * Drauf achten, daß die Kopfgrundplatten (1) und (2) parallel sind.

(Einstellungen nach dem Wiedereinbau)

Audio/Synchronkopf-Abgleich
X-Wert-Abgleich
Audio-Wiedergabepegel-Abgleich
Audio-Vormagnetisierungspegel-Abgleich

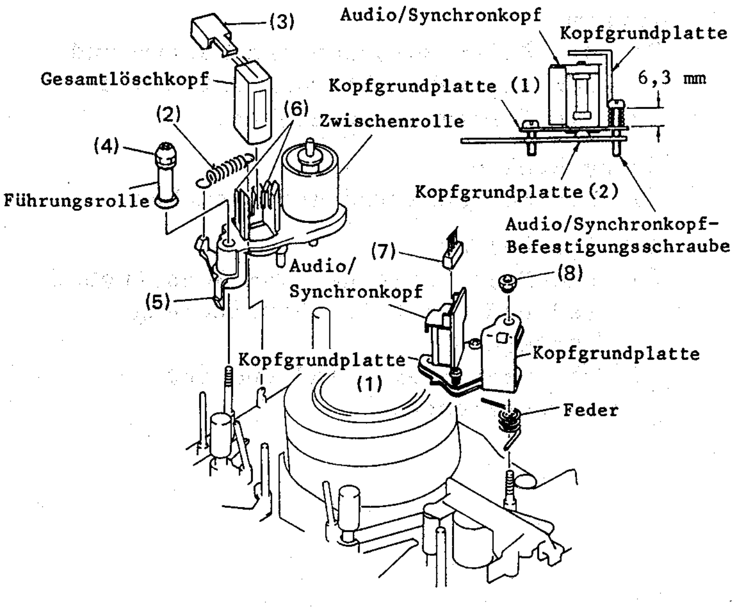

(3)
Audio/Synchronkopf
Kopfgrundplatte
Gesamtlöschkopf
Kopfgrundplatte (1)
6,3 mm
(2)
(6)
Zwischenrolle
(4)
Führungsrolle
Kopfgrundplatte (2)
Audio/Synchronkopf-Befestigungsschraube
(7)
(8)
Audio/ Synchronkopf
(5)
Kopfgrundplatte (1)
Kopfgrundplatte
Feder

Abb. 7-1B Zwischenrolle/Gesamtlöschkopf und Audio/Synchronkopf

2. Kopftrommel-Motoreinheit (Abb. 7-2)

1) Die obere Abdeckung abnehmen (siehe Punkt 1 unter "Ausbau des Gehäuses").
2) Eine (1) Schraube und die statische Entladebürste abnehmen.
3) Die Vor-/Aufnahmeverstärker-Leiterplatte herausziehen (siehe Punkt 4 im Abschnitt "Ausbau der Leiterplatten").

(Bodenseite)
4) Die Bodenplatte entfernen (siehe Punkt 1 unter "Ausbau des Gehäuses").
5) Die Stecker von der Kopftrommelmotor-Leiterplatte abziehen.
6) Drei (3) Befestigungsschrauben der Kopftrommel entfernen.

(Oberseite)
7) Die Kopftrommel-Motoreinheit nach oben herausziehen.

(Vorsichtsmaßnahmen während der Arbeiten)
- * Die Einheit auf der Seite abstellen, da die Schrauben an der gegenüberliegenden Seite angeordnet sind, von welcher die Kopftrommel entfernt wurde.
- * Die Spitzen der Videoköpfe nicht mit den Fingern oder mit Werkzeugen berühren.

(Einstellungen nach dem Wiedereinbau)
Einstellung nach dem Austausch der Kopftrommel

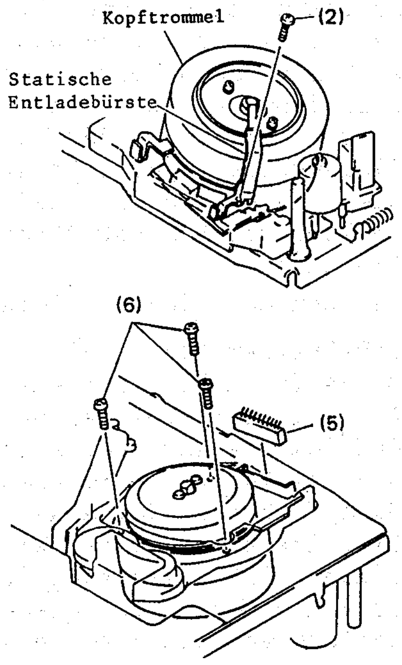


Abb. 7-2 Kopftrommel-Motoreinheit

3. Capstanmotoreinheit (Abb. 7-3)

1) Die Bodenplatte ausbauen (siehe Punkt 1 unter "Ausbau des Gehäuses").
2) Den Tellerriemen ausbauen.
3) Den Stecker abziehen.
4) Drei (3) Schrauben entfernen und den Capstanmotoreinheit herausziehen.
- * Die Capstanwelle sauber halten, wenn der Capstanmotor aus- oder eingebaut wird.

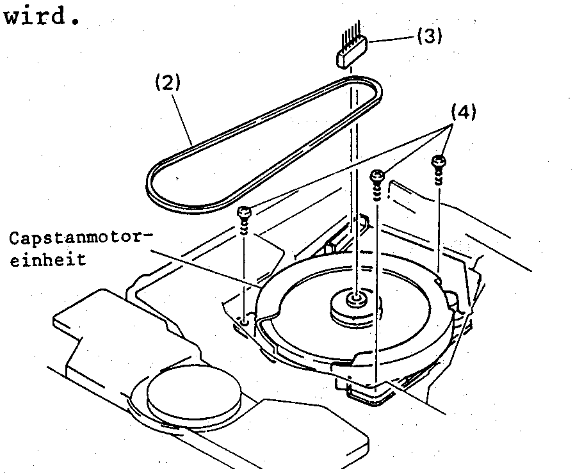


Abb. 7-3 Capstanmotoreinheit

4. Lademotor/Bandlaufwerk-Statusschalter (Abb. 7-4)

1) Die obere Abdeckung abnehmen (siehe Punkt 1 unter "Ausbau des Gehäuses").
2) Eine (1) Lasche freigeben und den Kassettedeckelöffner entfernen.
3) Den Stecker abtrennen.
4) Zwei (2) Laschen freigeben, mit welchen der Bandlaufwerk-Statusschalter befestigt ist.

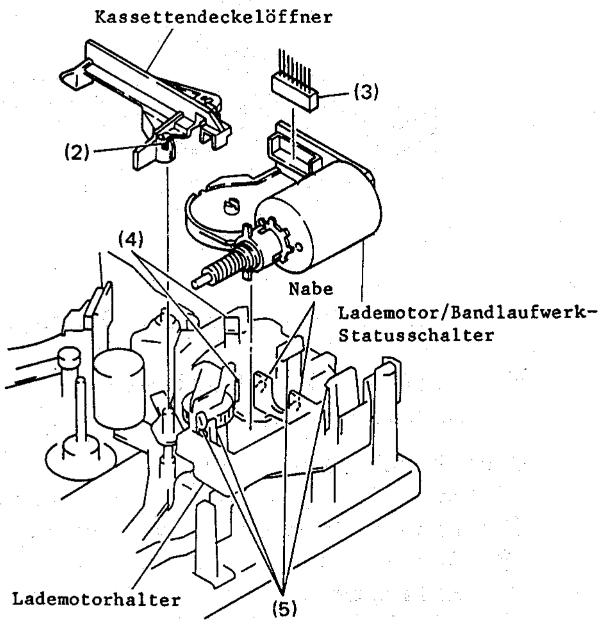


Abb. 7-4 Lademotor/Bandlaufwerk-Statusschalter und Kondensat-Sensor

5) Vier (4) Laschen freigebe und während die zwei (2) Naben des Motorhalters von dem Schraubenbohrungen in dem Motor freigegeben werden, den Lademotor/Bandlaufwerk-Statusschalter anheben. (Abb. 7-4)

* Die nachfolgenden Komponenten 5 - 11 werden beschrieben, als ob die obere Abdeckung, die Bodenplatte, die Frontplatte und der Kassetten Lademechanismus bereits ausgebaut wurden (siehe Punkt 1 unter "Ausbau des Gehäuses" und Punkt 1 im Abschnitt "Kassetten-Lademechanismus").

5. Spannarm/Spannband (Abb. 7-5)

1) Die Feder zwischen dem Spannarm und dem Federhalter entfernen.
2) Die Befestigungsschraube des Spannbandes lösen.
3) Die Befestigung mit dem Spannarm freigeben, die Vorratsteller-Hilfsbremse in Pfeilrichtung bewegen und das Spannband und den Spannarm entfernen.

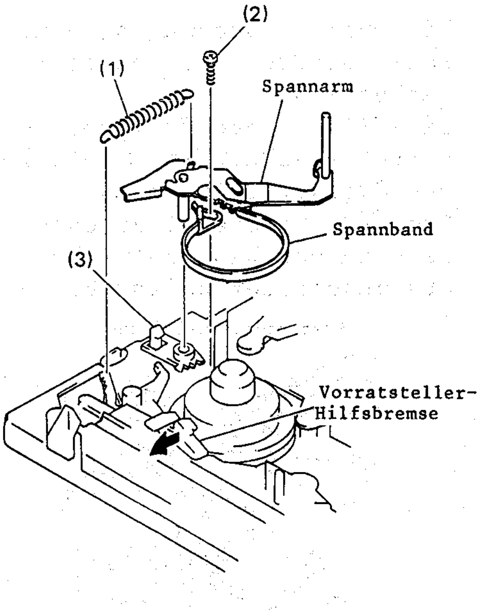


Abb. 7-5 Spannarm/Spannband

6. Gleitblock und Teller-Antriebszahnrad

Gleitblock (Abb. 7-6)
1) Zwei (2) Schrauben entfernen.

(Vorsichtmaßnahmen beim Wiedereinbau)
* Den Gleitblock einbauen, während die Hilfsbremse und die Hauptbremse in Pfeilrichtung (A/B) gedrückt werden.
* Darauf achten, daß die Naben der Ladehalterungseinheit in die Gleitstücke eingesetzt sind.

Wickelteller-Antrieszahnrad (Abb. 7-6)
2) Das Wickelteller-Zahnrad von der Wickelteller-Zahnradwelle abziehen.

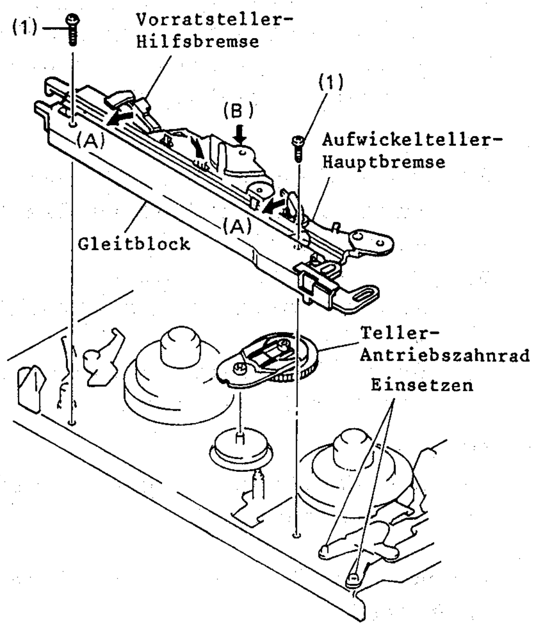


Abb. 7-6 Gleitblock und Teller-Antriebszahnrad

7. Vorrats-/Aufwickelteller, Halbladearm und Zwischenarm

Vorratsteller (Abb. 7-7)
1) Den Gleitblock entfernen (siehe Punkt 6).
2) Den Spannarm und das spannband ausbauen (siehe Punkt 5).
3) den vorratsteller herausziehen.

(Vorsichtmaßnahmen beim Wiedereinbau)
* Darauf achten, daß eine Distanzscheibe an der Wickelteller-Einbauwelle angebracht wird.

(Einstellungen nach dem Wiedereinbau)
Einstellung der Spannstiftposition und der Spannung
Einstellung der Wickeltellerhöhe

Aufwickelteller (Abb. 7-7)
4) Die Aufwickeltellerbremse in Pfeilrichtung bewegen und den Aufwickelteller herausziehen.

(Vorsichtsmaßnahmen beim Wiedereinbau)
* Darauf achten, daß eine Distanzscheibe an der Wickelteller-Einbauwelle angebracht ist.

(Einstellungen nach dem Wiedereinbau)
Einstellung der Wickeltellerhöhe

Halbladearm
5) Die Schiebe entfernen und den Arm nach oben herausziehen.
 * Das untere Ende der Feder unter dem Halbladearm an dem Anschlag des Aufwickelführungsstiftes und das obere Ende an dem Anschlag des Halbladearms einhängen.

Zwischenarm
6) Eine (1) Lasche in Pfeilrichtung freigeben und den Zwischenarm abnehmen.

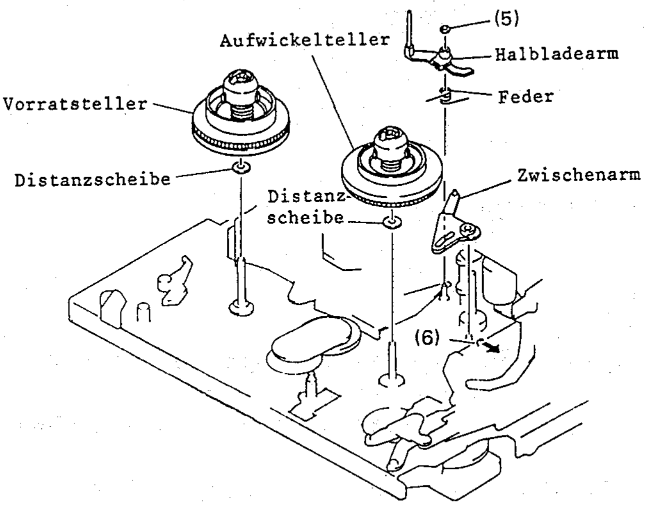

(5)
Aufwickelteller
Halbladearm
Vorratsteller
Feder
Distanzscheibe
Zwischenarm
Distanzscheibe
(6)

Abb. 7-7 Vorrats-/Aufwickelteller, Halbladearm und Zwischenarm

8. Rollen und Führungen (Abb. 7-8)

Andruckrolle
1) Eine (1) Lasche freigeben und den Kassettedeckelöffner entfernen.
2) Die Andruckrolleneinheit herausziehen.

(Vorsichtsmaßnahmen beim Wiedereibau)
 * Darauf achten, daß der Stift der Andruckrolle in die Bohrung im Andruckrollen-Betätigungsarm eingesetzt wird.
 * Die Bandkontaktfläche der Andruckrolle reinigen.

Vorratsteller-Führungsstift
3) Die Führungsstift-Befestigungsschraube lösen und den Führungsstift herausziehen.

(Vorsicht beim Wiedereinbau)
 * Die Bandkontaktfläche des Führungsstiftes reinigen.

(Einstellung nach dem Wiedereinbau)
Einstellung der Führungsstifthöhe

Aufwickelteller-Führungsstift
4) Die Führungsstift-Befestigungsschraube lösen und den Führungsstift herausziehen.

(Vorsicht beim Wiedereinbau)
 * Die Bandkontaktfläche des Führungsstiftes reinigen.

(Einstellung nach dem Wiedereinbau)
Einstellung der Führungsstifthöhe

Führungsrollen
 * Die Vorratsteller- und Aufwickelteller-Führungsrollen nach dem gleichen Verfahren ausbauen.
5) Die Führungsrollen-Sechskant-Befestigungsschraube lösen.
6) Die Führungsrolle gegen den Uhrzeigersinn drehen, um sie Herauszuziehen.

(Einstellung nach dem Wiedereinbau)
Einstellung der Führungsrollenhöhe

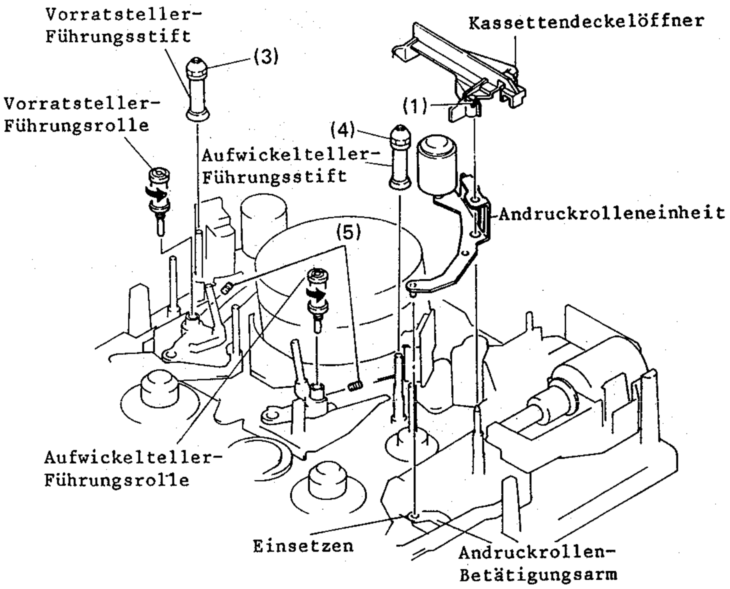

Vorratsteller-Führungsstift
Kassettendeckelöffner
(3)
Vorratsteller-Führungsrolle
(1)
(4)
Aufwickelteller-Führungsstift
Andruckrolleneinheit
(5)
Aufwickelteller-Führungsrolle
Einsetzen
Andruckrollen-Betätigungsarm

Abb. 7-8 Rollen und Führungen

9. Lademotorblock, Bremsgestängearm und Gesamtlöschkopf-Bremsarm (Abb. 7-9)

Lademotorblock
1) Die Lasche freigeben und den Kassettendeckelöffner entfernen.
2) Die Stecker von der Lademotor-Leiterplatte abziehen.
3) Zwei (2) Schrauben entfernen und drei (3) Laschen freigeben.
4) Den Lademotor und den Motorhalter entfernen, während der durch einen Pfeil (A) gekennzeichnete Abschnitt festgehalten wird, damit die Ladehalterungseinheit nicht angehoben wird.

(Einstellung nach dem Wiederinbau)
Einstellung des Bandlaufwerk-Statusschalters

Bremsgestängearm

5) Den Gleitblock entfernen (siehe Punkt 6).
6) Den Aufwickelteller entfernen (siehe Punkt 7).
7) Die Feder zwischen dem Bremsgestängearm und der Ladehalterung entfernen.
8) Die Nabe des Bremsen-Schaltarmes freigeben und den Bremsgestängearm entfernen.

FS-Bremsarm

9) Die Feder zwischen dem FS-Bremsarm und dem Bandlaufwerk-Chassis entfernen.
10) Eine (1) Lasche freigeben und den FS-Bremsarm herausziehen.

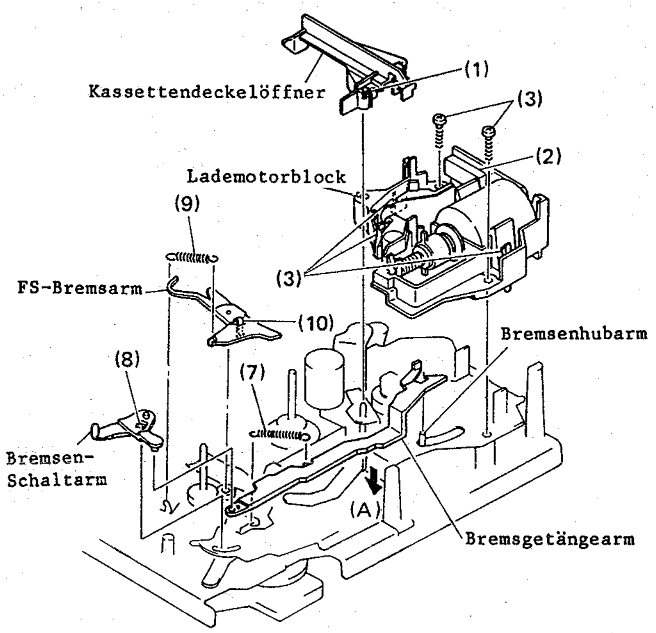

Kassettendeckelöffner
(1)
(3)
(2)
Lademotorblock
(9)
(3)
FS-Bremsarm
(10)
Bremsenhubarm
(8)
(7)
Bremsen-
Schaltarm
(A)
Bremsgetängearm

Abb. 7-9 Lademotorblock, Bremsgestängearm, FS-Bremsarm

10. Ladehalterungseinheit und Aufwickelteller-Bremsenladehalterungseinheit (Abb. 7-10)

1) Den Gleitblock entfernen (siehe Punkt 6).
2) Den Aufwickelteller entfernen (siehe Punkt 7).
3) Die Andruckrolle entfernen (siehe Punkt 8).
4) Den Lademotorblock entfernen (siehe Punkt 9).
5) Den Bremsgetängearm entfernen (siehe Punkt 9).
6) Eine (1) Schraube entfernen und die Nabe des Ladegleitzahnrades durch die Bohrung in dem Hubarm ziehen, um die Einheit anzuheben.

Aufwickeltellerbremse (Abb. 7-10)

7) Den Bremsenbetätigungsarm entfernen (siehe Punkt 11).
8) Eine (1) Lasche freigeben und die Aufwickeltellerbremse entfernen.

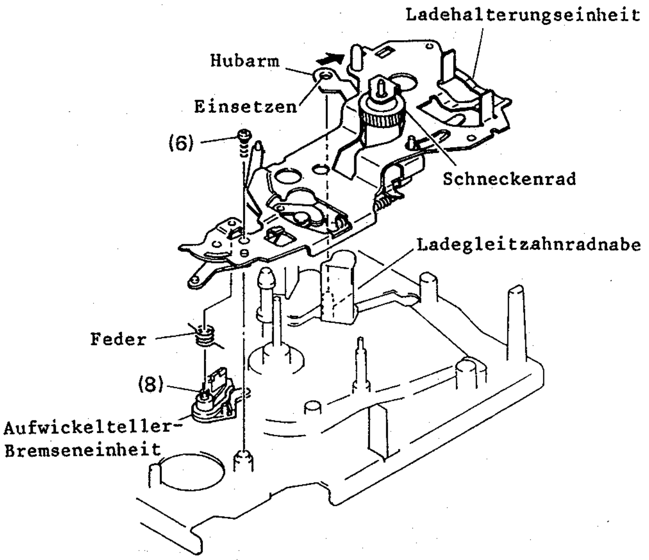

Ladehalterungseinheit
Hubarm
Einsetzen
(6)
Schneckenrad
Ladegleitzahnradnabe
Feder
(8)
Aufwickelteller-
Bremseneinheit

Abb. 7-10 Ladehalterungseinheit und Aufwickelteller-Bremsenladehalterungseinheit

* Die Komponenten in Punkt 11 werden beschrieben, als ob die Ladehalterungseinheit bereits ausgebaut wurde (siehe Punkt 10).

11. Bremsenbetätigungsarm, Modus-Zahnrad, Schneckenrad, Andruckrollen-Betätigungsarm, Modus-Schaltarm und Bremsenhubarm (Abb. 7-11)

Bremsenbetätigungsarm

1) Die Scheibe entfernen und den Bremsenbetätigungsarm herausziehen.

Modus-Zahnrad

2) Den Hubarm herausziehen.
3) Das Modus-Zahnrad herausziehen.

Schneckenrad

4) Das Schneckenrad herausziehen.

Andruckrollen-Betätigungsarm, Modus-Schaltarm

5) Die Feder zwischen dem Andruckrollen-Betätigungsarm und der Ladehalterung entfernen.
6) Den Andruckrollen-Betätigungsarm herausziehen.
7) Eine (1) Lasche freigeben und den Modus-Schaltarm herausziehen.

Bremsenhubarm

8) Den Bremsenhubarm herausziehen.

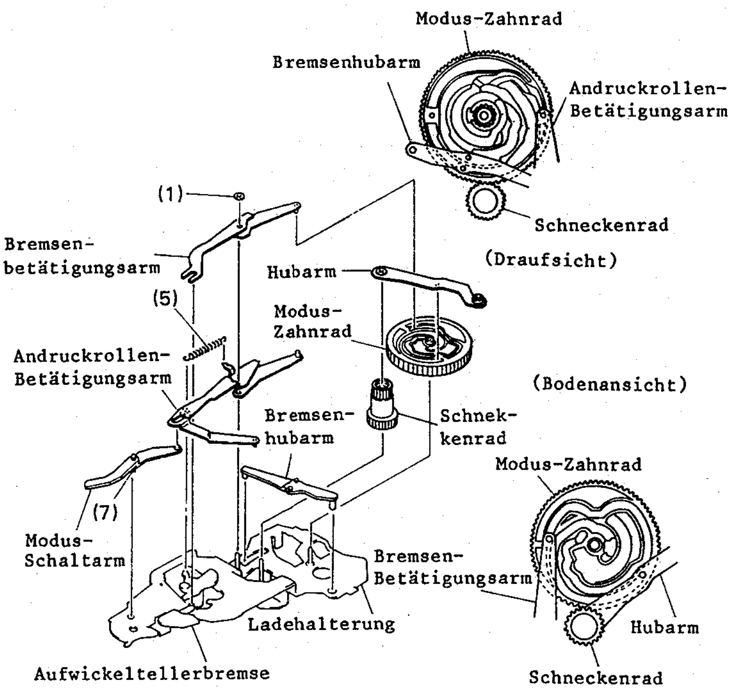

Modus-Zahnrad
Bremsenhubarm
Andruckrollen-Betätigungsarm
Schneckenrad
(Draufsicht)
(1)
Bremsen-betätigungsarm
Hubarm
(5)
Modus-Zahnrad
Andruckrollen-Betätigungsarm
(Bodenansicht)
Bremsen-hubarm
Schnek-kenrad
Modus-Zahnrad
(7)
Modus-Schaltarm
Bremsen-Betätigungsarm
Ladehalterung
Hubarm
Aufwickeltellerbremse
Schneckenrad

Abb. 7-11 Bremsenbetätigungsarm, Modus-Zahnrad, Schneckenrad, Andruckrollen-Betätigungsarm, Modus-Schaltarm und Bremsenhubarm

12. Kopftrommel-Motorgrundplatte und Vorrats-/Aufwickelteller-Ladearme (Abb. 7-12)

Kopftrommel-Motorgrundplatte

1) Den Kassetten-Lademechanismus ausbauen (siehe Punkt 1 im Abschnitt "Ausbau des Kassetten-Lademechanismus").

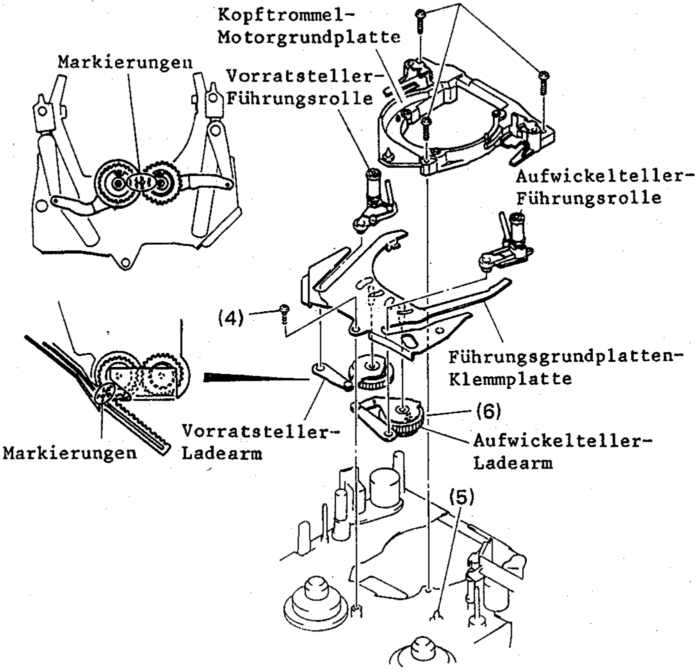

(3)
Kopftrommel-Motorgrundplatte
Markierungen
Vorratsteller-Führungsrolle
Aufwickelteller-Führungsrolle
(4)
Führungsgrundplatten-Klemmplatte
(6)
Vorratsteller-Ladearm
Aufwickelteller-Ladearm
Markierungen
(5)

Abb. 7-12 Kopftrommel-Motorgrundplatte und Vorrats-/Aufwickelteller-ladearme

2) Die Kopftrommel-Motoreinheit entfernen (siehe Punkt 2).
3) Drei (3) Schrauben entfernen und die Kopftrommel-Motorgrundplatte herausnehmen. (Abb. 7-12)

Vorrats-/Aufwickelteller-Ladearme (Abb. 7-12)

4) Eine (1) Schraube entfernen.
5) Eine (1) Lasche freigeben und die Führungsgrundplatten-Klemmplatte mit den Vorrats-/Aufwickelteller-Führungsrolle abnehmen.
6) Eine (1) Lasche freigeben und den Aufwickelteller-Ladearm entfernen.
7) Den Vorratsteller-Ladearm entfernen.

13. Aufwickelteller-Riemenscheibe und Kupplungs-Zahnradeinheit (Abb. 7-13)

1) Den Wickeltellerriemen freigeben.
2) Die Scheibe entfernen und die Aufwickelteller-Riemenscheibe herausziehen.

Kupplungszahnradeinheit (Abb. 7-13)

3) Den Kassetten-Lademechanismus entfernen (siehe Punkt 1 im Abschnitt "Ausbau des Kassetten-Lademechanismus").
4) Den Gleitblock und das Wickelteller-Antriebszahnrad entfernen (siehe Punkt 6).
5) Den Wickeletllerriemen in Schritt 1) entfernen und drei (3) Schrauben lösen.

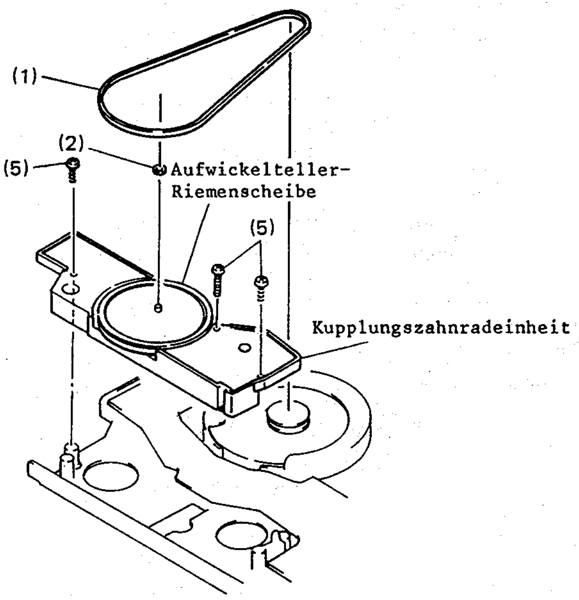

(1)
(2)
(5)
Aufwickelteller-Riemenscheibe
(5)
Kupplungszahnradeinheit

Abb. 7-13 Aufwickelteller-Riemenscheibe und Kupplungs-Zahnradeinheit

14. Aufwickelteller-Zahnrad, Schaltarm, Schaltzahnrad, Zwischenzahnrad, FL-Schaltzahnrad und FL-Schalthebel (Abb. 7-14)

1) Den Kassetten-Lademechanismus entfernen (siehe Punkt 1 im Abschnitt "Ausbau des Kassetten-Lademechanismus").
2) Den Gleitblock und das Wickelteller-Antriebszahnrad entfernen (siehe Punkt 6).
3) Die Kupplungs-Zahnradeinheit entfernen (siehe Punkt 13).

Aufwickelteller-Zahnrad
4) Die Scheibe entfernen und das Aufwickelteller-Zahnrad herausziehen.

Schaltarm, Schaltzahnrad
5) Das Aufwickelteller-Zahnrad entfernen.
6) Eine (1) Lasche freigeben und die in den Kupplungsarm eingehängte Feder entfernen.
7) Zwei (2) Laschen freigeben und den Schaltarm entfernen.
8) Die Scheibe entfernen und das Schaltzahnrad herausziehen.

Zwischenzahnrad
9) Eine (1) Lasche freigeben und das Zwischenzahnrad herausziehen.

FL-Schaltzahnrad, FL-Schalthebel
10) Die Kappe, Feder und Scheibe entfernen und das FL-Schaltzahnrad herausziehen.
11) Zwei (2) Laschen freigeben und den FL-Schalthebel entfernen.

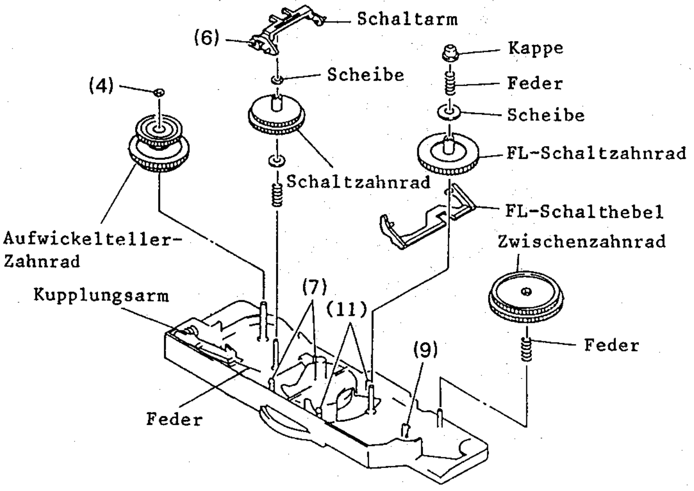

Schaltarm
(6)
Kappe
Scheibe
Feder
(4)
Scheibe
FL-Schaltzahnrad
Schaltzahnrad
FL-Schalthebel
Aufwickelteller-Zahnrad
Zwischenzahnrad
Kupplungsarm
(7)
(11)
(9)
Feder
Feder

Abb. 7-14 Aufwickelteller-Zahnrad, Schaltarm, Schaltzahnrad, Zwischenzahnrad, FL-Schaltzahnrad und FL-Schalthebel

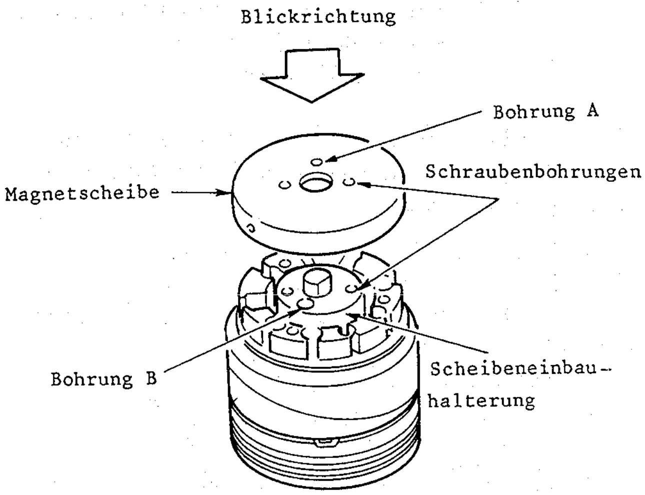
8. Anbringen der Magnetscheibe am Kopftrommelmotor

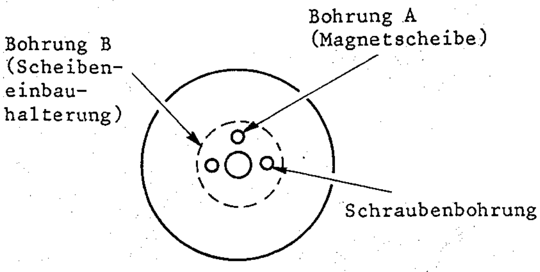
Vorsicht:

o Die an der Basis des Kopftrommelmotors angebrachte Rotromagnetscheibe ist mit Magnetpolen versehen. Falls diese Scheibe nicht richtig angebracht wird, kann der Videorecorder nicht richtig funktionieren. Bei einem Austausch ist der folgenden Vorgang einzuhalten, um die Scheibe richtig anzubringen.

Anbringen:

o Die Rotormagnetscheibe so anbringen, daß die Bohrung (A) in der Scheibe gegenüberliegend der Bohrung (B) in der Scheibeneinbauhalterung gegenüber den Schraubenbohrungen angeordnet ist.


Blickrichtung
Bohrung A
Schraubenbohrungen
Magnetscheibe
Bohrung B
Scheibeneinbau-halterung


Bohrung A (Magnetscheibe)
Bohrung B (Scheiben-einbau-halterung)
Schraubenbohrung

Magnetscheiben-Einbaudiagramm

ELEKTRISCHE ABGLEICHE

Für die elektrischen Abgleiche sind die folgenden Prüfeinrichtungen und Bänder erforderlich.

1) Doppel-Oszilloskop
2) Farbbalkengenerator
3) Röhrenvoltmeter
4) Gleichspannungsmesser
5) Frequenzzähler
6) Fernseh-Monitor
7) Abgleichband (PAL)
8) Leer-Kassette

Wartungsposition

Die obere Abdeckung ausbauen (siehe Punkt 1 unter "Ausbau des Gehäuses") und die Haupt- und Y/Chroma-Leiterplatten sowie die Frequenzsynthesizer-Tuner-Leiterplatte (nur für modelle CT und VPS) von der Oberseite der Einheit einstellen.

Vorsichtsmaßnahmen während der Abgleiche

1) Wenn keine anderen Angaben aufgeführt sind, gelten die folgenden Bedingungen:
   - o Oszilloskop-Proben: 10:1
   - o Oszilloskop-Synchronisierung: Interne Synchronisierung
   - o Spurlagenregler: Mittelstellung
2) Falls mehr als ein Abgleich durchgeführt wird, die Abgleiche in der aufgeführten Reihenfolge ausführen.

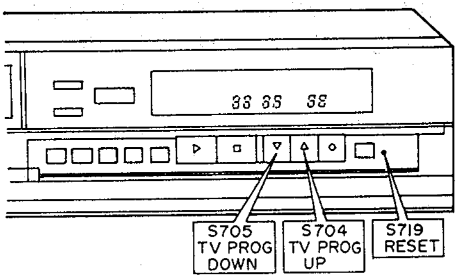
Rückstellen der Mikroprozessoren

Obwohl die Mikroprozessoren in dieser Einheit mit dem Abzeihen des Netzkabelsteckers von der Netzdose zurückgestellt werden, wird der Timer-Mikroprozessor für etwa 15 Minuten nicht zurückgestellt, da er mit einer Speicherschutzschaltung ausgerüstet ist. S719 auf der Timer-Leiterplatte drücken, um die Rückstellung innerhalb von 15 Minuten nach dem Abziehen des Netzkabelsteckers vorzunehmen.

Einstellen des Spurlagenreglers auf die Mittelstellung

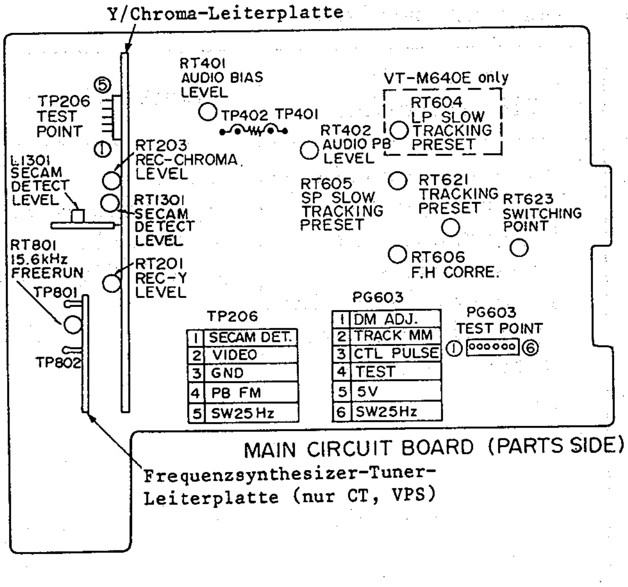
Wenn "Spurlagenregler: Mittelstellung" spezifiziert ist, den Spurlagenregler wie folgt in die Mittelstellung bringen.

- ° S704 (TV PROG UP) und S705 (TV PROG DOWN) auf der Timer-Leiterplatte gleichzeitig drücken.

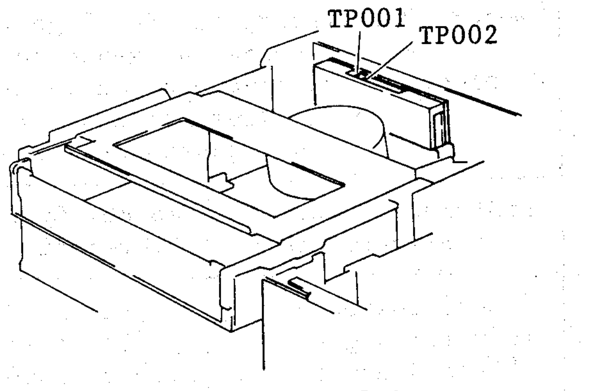

S705 TV PROG DOWN
S704 TV PROG UP
S719 RESET

ANORDNUNG DER ABGLEICHTEILE

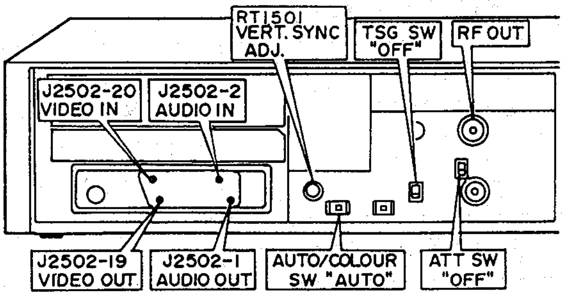
RT1301
L1301 : (CT.VPS only)


Y/Chroma-Leiterplatte
RT401 AUDIO BIAS LEVEL
VT-M640E only
TP206 TEST POINT
⑤
①
TP402 TP401
RT604 LP SLOW TRACKING PRESET
RT402 AUDIO PB LEVEL
RT203 REC-CHROMA LEVEL
L1301 SECAM DETECT LEVEL
RT1301 SECAM DETECT LEVEL
RT605 SP SLOW TRACKING PRESET
RT621 TRACKING PRESET
RT623 SWITCHING POINT
RT801 15.6kHz FREERUN
TP801
RT606 F.H CORRE.
RT201 REC-Y LEVEL
PG603
PG603 TEST POINT
① ⑥
TP802
TP206
1 SECAM DET.
2 VIDEO
3 GND
4 PB FM
5 SW25Hz
1 DM ADJ.
2 TRACK MM
3 CTL PULSE
4 TEST
5 5V
6 SW25Hz
MAIN CIRCUIT BOARD (PARTS SIDE)
Frequenzsynthesizer-Tuner-Leiterplatte (nur CT, VPS)

Komponenten auf der Haupt-Leiterplatte (Bestückungsseite)


TP001
TP002

Komponenten auf der Vor/Aufnahmeverstärker-Leiterplatte


RT1501 VERT. SYNC ADJ.
TSG SW "OFF"
RF OUT
J2502-20 VIDEO IN
J2502-2 AUDIO IN
J2502-19 VIDEO OUT
J2502-1 AUDIO OUT
AUTO/COLOUR SW "AUTO"
ATT SW "OFF"

1. Abgleich des Servo-Schaltkreises

1) Kopfwechselpunkt

Zweck des Abgleichs und bei fehlerhaftem Abgleich auftretende Probleme

Zweck: Einstellen des Kopfwechselpunktes auf fast die Mitte der während der Wiedergabe überlappten CH-1 und CH-2 Hüllkurven.

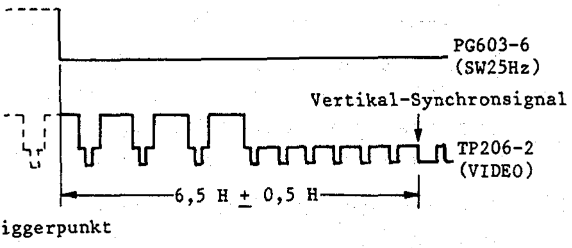
Probleme:
- o Verschlechterung des Vertikal-Synchronsignals und Auftreten von vertikalem Jitter.
- o Schaltstörungen im unteren Teil des Bildes.

Prüfeinrichtungen/ -vorrichtungen	**Anschlußpunkte der Prüfeinrichtungen**	**Status des Videorecorders**	**Abgleichpunkt**
° Oszilloskop (Einstellungen) ° Den Synchron-Flankensteilheitsschalter auf "-" einstellen. ° Mit CH-2 triggern	° CH-1: TP206-2 (VIDEO) ° CH-2: PG603-6 (SW25Hz)	° Wiedergabe des Abgleichbandes (Treppenstufen) ° Spurlagernregler: Mittelstellung	° RT623 Kopfwechselpunkt (HEAD SWITCHING POINT)
° Abgleichband			

Abgleichvorgang

Vertikal-Synchronsignal:
6,5H ± 0,5H von der Abfallflanke (Triggerpunkt) des SW25Hz Impulses

Wellenform



2) Spurlagen-Voreinstellung

Zweck des Abgleichs und bei fehlerhaftem Abgleich auftretende Probleme

Zweck: Optimierung der Spurlage während der Wiedergabe eines auf diesem Videorecorder aufgenommenen Bandes.

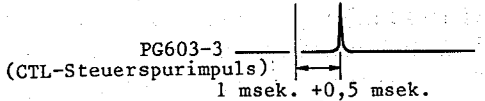
Probleme:
- o Rauschstörungen in Mittelstellung des Spurlagenreglers.
- o Das Rauschen kann nicht vollstädnig entfernt werden, wenn die Spurlagenreglertasten (TV PROG) gedrückt werden.

Prüfeinrichtungen/ -vorrichtungen	**Anschlußpunkte der Prüfeinrichtungen**	**Status des Videorecorders**	**Abgleichpunkt**
° Oszilloskop (Einstellungen) ° Den Synchron-Flankensteilheitsschalter auf "-" einstellen. ° Mit CH-2 triggern	° CH-1: PG603-3 (Steuerspurimpuls) ° CH-2: PG603-3 (SW25Hz)	° Aufnahme des Farbbalkensignals und Wiedergabe auf diesem Videorecorder.(SP-Modus) ° Spurlagenregler: Mittelstellung	° RT621 Spurlagen-Voreinstellung (TRACKING PRESET)
° Farbbalkengenerator	° J2502-20 (Video-Eingang) ° J2502-18 (VIDEO GND)		
° Leer-Kassette			

Abgleichvorgang (VT-M630E)

1) Auf 1 msek. ±0,5 msek. von dem Abfall des SW25Hz Signals bis zur Spitze des CTL Steuerspurimpulses abgleichen.

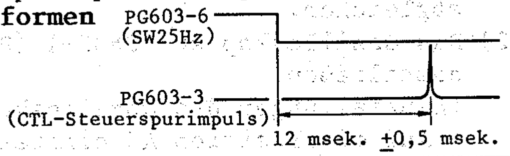
Wellenformen



Abgleichvorgang (VT-M640E)

Auf 12 msek. ±0,5 msek. von dem Abfall des SW25Hz Signals bis zur Spitze des CTL-Steuerspurimpulses abgleichen.

Wellenformen



3) Vertikal-Synchronisierung

Zweck des Abgleichs und bei fehlerhaftem Abgleich auftretende Probleme

Zweck: Änderung der Zeitsteuerung für zusätzlichen Vertikal-Treiberimpuls und Unterdrückung von vertikalem Jitter im Bild während der Trick-Wiedergabe.

Probleme: Vertikaler Jitter im Bild während der Trick-Wiedergabe.

Prüfeinrichtungen/ -vorrichtungen	Anschlußpunkte der Prüfeinrichtungen	Status des Videorecorders	Abgleichpunkt
° Fernsehmonitor	° HF-Ausgang	° Aufnahme des Farbbalkensignals und Standbild-Wiedergabe auf diesem Videorecorder.	° RT1501 Vertikal-Synchronisierung (VERT. SYNC ADJ)
° Farbbalken-generator	° J2502-20 (Video-Eingang)		
° Leer-Kassette			

4) Zeitlupen-Spurlagenvoreinstellung

Zweck des Abgleichs und bei fehlerhaftem Abgleich auftretende Probleme

Zweck: Optimierung der Spurlage während der Zeitlupen-Wiedergabe.

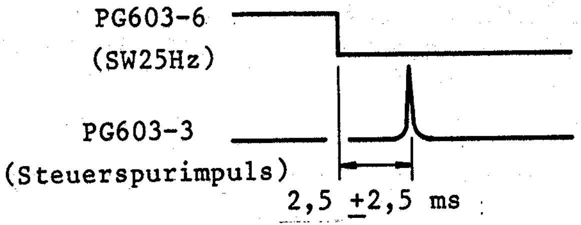
Probleme: o Ein Rauschbalken erscheint in dem Bild Während der Zeitlupenwiedergabe.

Prüfeinrichtungen/ -vorrichtungen	Anschlußpunkte der Prüfeinrichtungen	Status des Videorecorders	Abgleichpunkte
° Oszilloskop (Einstellungen des Oszilloskops) ° Den Flankensteilheitschalter auf "-" einstellen. ° Mit CH-2 triggern.	° CH-1: PG603-3 (Steuerspurimpuls) ° CH-2: PG603-6 (SW25Hz)	° Das Farbbalkensignal aufnehmen und auf diesem Gerät in dem Zeitlupenmodus wiedergeben. (SP-Modus)	° RT605 (SP SLOW) ° RT606 (H.F. CORRE.) ° RT604 (LP SLOW)
° Farbbalken-generator	° J2502-20 (VIDEO IN) ° J2502-18 (VIDEO GND)		
	° HF-Ausgang		

Abgleichvorgang (VT-M630E)

1) RT605: Auf 2,5 ±2,5 ms von der Anstiegsflanke des SW25Hz Signals bis zur Spitze des CTL-Steuerspurimpulses abgleichen.
2) Das Oszilloskop an PG603-1 (DM ADJ.) anschließen.
   (Einstellungen des Oszilloskops)
   ° Auf die Position AC einstellen.
   ° Bereich: 0,5 s/Teilung
3) RT606: Den Jitter im Fernsehbild minimieren, und zwar innerhalb von 130 ±20 mV von dem Massepegel bis zu dem impulsartigen Spitzenwert.

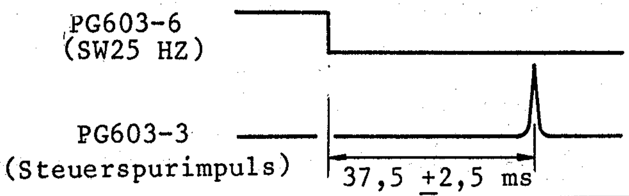
Wellenformen



Abgleichvorgang (VT-M640E)

1) RT605: Das Rauschen aus dem Fernsehbild von der Unterseite des bildschirms entfernen.
2) Das Oszilloskop an PG603-1 (DM ADJ.) anschließen.
   (Einstellungen des Oszilloskops)
   ° Auf Position AC stellen.
   ° Bereich: 0,5 s/Teilung
3) RT606: Den Jitter im Fernsehbild minimieren, und zwar in einem Bereich von 130 ±20 mV von dem Massepegel bis zu dem impulsartigen Spitzenwert.
4) Nochmals ein Farbbalkensignal in dem LP-Modus aufnehmen und in dem Zeitlupenmodus wiedergeben.
5) Das oszilloskop anschließen, wie es in der obigen Tabelle dargestellt ist.
6) RT604: Auf 37,5 ±2,5 ms von der Abfallflanke des SW25Hz Signals bis zur Spitze des CTL-Steuerspurimpulses abgleichen.

Wellenformen



2. Abgleich des Audio-Schaltkreises

1) Audio-Wiedergabepegel

Zweck des Abgleichs und bei fehlerhaftem Abgleich auftretende Probleme

Zweck: Einstellung des Audio-Wiedergabepegels auf den spezifizierten Wert.

Probleme: o Wenn ein auf einem anderen Videorecorder bespieltes Band wiedergegeben wird, stimmt der Wiedergabepegel nicht überein.

Prüfeinrichtungen/ -vorrichtungen	Anschlußpunkte der Prüfeinrichtungen	Status des Videorecorders	Abgleichpunkt
° Röhrenvoltmeter	° J2502-1 (Audio-Ausgang) ° J2502-4 (AUDIO GND)	° Abgleichband (Farbbalkensignal) wiedergeben.	° RT402 Audio-Wiedergabepegel (AUDIO PLAYBACK LEVEL)
° Abgleichband			

Abgleichvorgang

Auf eine Anzeige des Röhrenvoltmeters von -1,5 ±0,1 dBm abgleichen.

2) Audio-Vormagnetisierungspegel

Zweck des Abgleichs und bei fehlerhaftem Abgleich auftretende Probleme

Zweck: Einstellung der Audio-Vormagnetisierung während der Aufnahme auf den optimalen Wert.

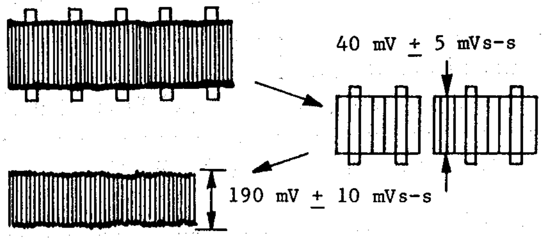
Probleme: o Vormagnetsierung zu hoch: Hochfrequenzgang verschlechtert.
o Vormagnetisierung zu nieder: Verzerrter Klang

Prüfeinrichtungen/ -vorrichtungen	Anschlußpunkte der Prüfeinrichtungen	Status des Videorecorders	Abgleichpunkt
° Röhrenvoltmeter	° TP401 (BIAS) ° TP402 (BIAS GND) sierungspegel	° Kein Signal aufnehmen.	° RT401 Audio-Vormagneti- (AUDIO BIAS LEVEL)
° Leer-Kassette			
Abgleichvorgang Auf eine Anzeige des Röhnenvoltmeters von 2,3 mV effekt. ± 0,1 mV effekt.			

3. Abgleich des Y/Chroma-Schaltkreises

1) Y/C-Aufnahmepegel

Zweck des Abgleichs und bei fehlerhaftem Abgleich auftretende Probleme
Zweck: Die Y/C-Aufnahmepegel auf die optimalen Werte einstellen.
Probleme:
- ° Parallelorgammverzerrungen im Bild während der Wiedergabe oder Farbfehler.
- ° Das wiedergegebene Bild wird dunkel und das Rauschen nimmt zu oder das Bild blendet und wird weißlich.

Prüfeinrichtungen/ -vorrichtungen	Anschlußpunkte der Prüfeinrichtungen	Status des Videorecorders	Abgleichpunkt
° Oszilloskop	° TP001 (auf dem Vorverstärker)	° E-zu-E-Modus	° RT203 Aufnahme-Chroma-signalpegel (REC C) ° RT201 Aufnahme-Luminanz-Signalpegel (REC Y)
° Farbbalken-generator	° J2502-20 (Video-Eingang) ° J2502-18 (VIDEO GND)		
° Reer-Kassette			
Abgleichvorgang 1) RT203: RT201 auf Minimum stellen und RT203 so einstellen, daß der Chroma-Aufnahmepegel 40 mV ±5 mVs-s wird. 2) RT201: RT201 so abgleichen, daß der Luminanz-Aufnahmepegel 190 mV ± 10 mVs-s beträgt.		**Wellenform** 	

2) Secam-Detektorpegel

Zweck des Abgleichs und bei fehlerhaftem Abgleich auftretende Probleme
Zweck: Einstellung des Secam-Detektorpegels auf den vorgeschriebenen Wert.
Probleme:
- ° Während der automatischen Diskriminierung werden PAL und SECAM falsch diskriminiert.

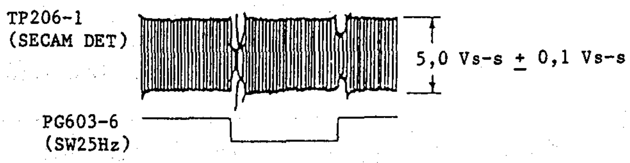
Prüfeinrichtungen/ -vorrichtungen	Anschlußpunkte der Prüfeinrichtungen	Status des Videorecorders	Abgleichpunkt
° Oszilloskop	° CH-1: TP206-1 (SECAM DET.) ° CH-2: PG603-6 (SW25Hz)	° Aufnahme-Modus	° RT1301 ° L1301 (enthalten in IC205) Secam-Detektorpegel (SECAM DETECT LEVEL)
° SECAM-Farbbalkengenerator	° J2502-20 (Video-Eingang) ° J2502-18 (VIDEO GND)		
° Leer-Kassette			

Abgleichvorgang

1) RT1301 so abgleichen, daß die Amplitude der Wellenform 5 ±0,1 Vs-s beträgt.
2) Falls der Abgleich mit RT1301 nicht möglich ist, L1301 auf eine Amplitude von 5 Vs-s einstellen.

Hinweis:
Die Amplitude in der zweiten Hälfte der Vertikal-Synchronsignal-Wellenform messen.

Wellenform



4. Abgleich des Frequenzsynthesizer-Tuner-Schaltkreises (nur CT, VPS)

1. 15,6 kHz Freilauf-Abgleich

Zweck des Abgleichs und bei fehlerhaftem Abgleich auftretende Probleme
Zweck: Einstellen der an den Synchronsignal-Detektorschaltkreis in dem Kanalwahl-Schaltkreis angelegten Freilauf-Frequenz auf 15,6 kHz ±0,1 kHz.
Probleme: o Der Synchronsignaldetektor arbeitet nicht, so daß die Abstimmung nicht richtig ausgeführt wird.

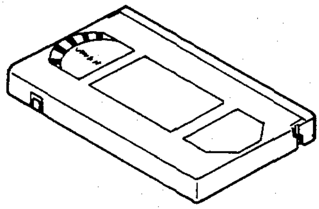
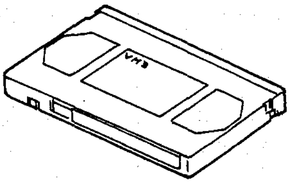
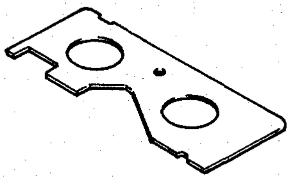
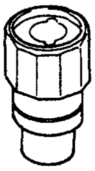
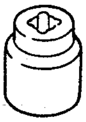
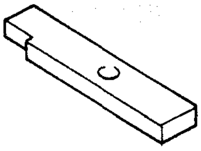
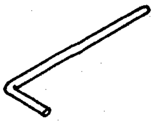
Prüfeinrichtungen/ -vorrichtungen	Anschlußpunkte der Prüfeinrichtungen	Status des Videorecorders	Abgleichpunkt
° Frequenzzähler	° TP802 ° TP801 (GND)	° Stoppmodus	° RT801

Abgleichvorgang

Auf eine Frequenzzähleranzeige von 15,6 kHz ±0,1 kHz abgleichen.

Einstellungen am Bandlaufwerk

Vorrichtungen und Abgleichbänder für die Einstellungen

1. Spannungsmesser Teile-Nr. 7099004 	2. Abgleichband Teile-Nr. 7099052 	3. Hauptmeßlehre Teile-Nr. 7099279 
4. Drehmomentmesser Teile-Nr. 7099039 	5. Adapter für Drehmomentmesser Teile-Nr. 7099035 	6. Wickelteller-Höhenmeßlehre Teile-Nr. 7099038 
7. 1,5 mm Sechskantschlüssel 0,9 mm Sechskantschlüssel 	—	—

Mechanische Einstellungen

1. Bandlaufwerk-Statusschalter

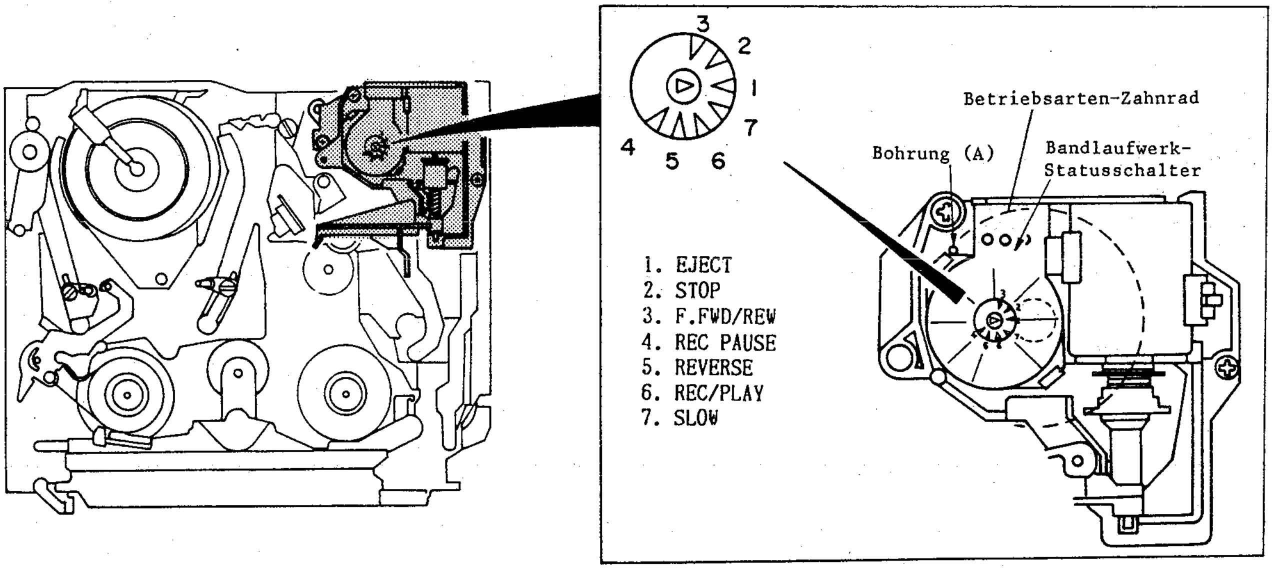
Zweck: Richtige Feststellung des Status des Bandlaufwerks und Vermeidung von Fehlbetrieb.

Prüfeinrichtungen/ -vorrichtungen	Vorbereitung für die Einstellung	Status des Videorecorders	Einstellpunkte
° Leer-Kassette	-----	° Stoppmodus (Kassette ausgeworfen)	° Bandlaufwerk-Statusschalter ° Betriebsarten-Zahnrad

Einstellvorgang

1) Darauf achten, daß die Pfeilmarkierung an der Mittelwelle des Bandlaufwerk-Statusschalters auf die Pfeilmarkierung der Bandlauf-Betriebsartennummer 1 weist.
Auch sicherstellen, daß die Bohrung (A) neben dem Bandlaufwerk-Statusschalter und die Bohrung in dem Betriebsarten-Zahnrad fluchten.
2) Falls die obigen Bedingungen nicht eingehalten werden, die Einstellung wie folgt ausführen.
   1. Die Bandlaufwerk-Statusschalter/Fädelmotor-Einheit ausbauen. (Siehe "Ausbau der mechanischen Haupt-Komponenten" in KAPITEL 2.)
   2. Das Betriebsarten-Zahnrad drehen, um die Position der Bohrung (A) auszurichten.
   3. Das Zahnrad an der Rückseite des Bandlaufwerk-Statusschalters drehen, so daß die Pfeilmarkierung an der Mittelwelle des Schalters auf die Pfeilmarkierung der Bandlaufwerk-Betriebsartennummer 1 weist.
   4. Die Bandlaufwerk-Statusschalter/Fädelmotor-Einheit im obigen Zustand einbauen.
3) Ein Leer-Kassette einsetzen und die verschiedenen Operationen ausführen, um auf richtiges Ein- und Ausfädeln zu prüfen.

Einstelldiagramm



Einstellung der Teile des Bandlaufwerks

Diese Teile betreffen den Bandweg von dem Vorratsteller über die Videoköpfe bis zu dem Aufwickelteller. Die Teile des Bandlaufwerks, besonders die mit dem Band in Berührung kommenden Teile, müssen sauber gehalten werden und dürfen keine Kratzer, Staub, Ölverschmutzungen usw. aufweisen. Das Bandlaufwerk dieses Geräts wurde werksseitig vor dem Versand eingestellt. Falls daher Teile des Bandlaufwerks erneuert werden, dann müssen nur die neuen Teile richtig eingestellt werden, um wieder stabilen Betrieb des Bandlaufwerks sicherzustellen.

1. Wickeltellerhöhe

Zweck: Einstellung der Wickelteller der Cassette auf die vorgeschriebene Höhe, um damit die Bandposition festzulegen.

Prüfeinrichtungen/ -vorrichtungen	Vorbereitung für die Einstellung	Status des Videorecorders	Einstellpunkte
° Hauptmeßlehre (Teile-Nr. 7099279) ° Wickelteller-Höheneinstellehre (Teile-Nr. 7099038)	1) Den Cassetten-Lademechanismus ausbauen. 2) Die Hauptmeßlehre montieren und die Wickelteller-Höheneinstellehre darauf anbringen.	—	° Distanzscheiben an dem Vorratsteller und Aufwickelteller

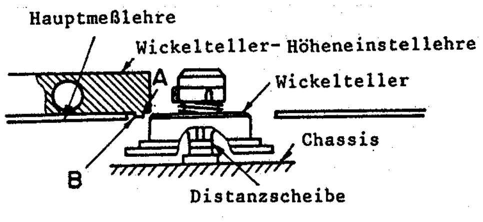
Einstellvorgang

1) Darauf achten, daß sich der Wickelteller zwischen den Abschnitten A und B der Wickelteller-Höheneinstellehre befindet.
2) Befindet sich der Wickelteller nicht zwischen den Abschnitten A und B der Einstellehre, die Distanzscheiben (erhältlich mit 0,50 mm Dicke) austauschen, um die richtige Position zu erhalten.

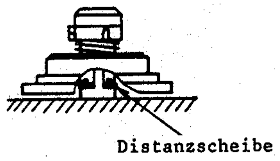
Vorsicht:

Wenn der Spannarm und das Spannband ausgebaut wurden, nach dem Wiedereinbau die Spannstift-Position und die Spannung einstellen.

Einstelldiagramm



(Vorratsteller)



(Aufwickelteller)

2. Spannstift-Position und Spannung

Zweck: Einstellung auf konstante Bandspannung, so daß stabiler Kontakt zwischen den Videoköpfen und dem Band erhalten wird.

Prüfeinrichtungen/ -vorrichtungen	Vorbereitung für die Einstellung	Status des Videorecorders	Einstellpunkte
Position —	—	1) Die obere Abdeckung abnehem. 2) Den Videorecorder auf den Ladestatus schalten, ohne eine Cassette einzusetzen (siehe Seite 4-13).	**Position** Halter des Spannbandes
Spannung ° Spanncassette (Teile-Nr. 7099004)	—	**Spannung** 3) Die Spanncassette abspielen.	**Spannung** Einhängposition der Spannfeder

Einstellvorgang

- Position -

1) Die Spannband-Befestigungsschraube lösen.
2) Den Halter des Spannbandes in eine der Nuten 1 bis 3 einsetzen und den Abstand zwischen dem Spannstift und dem Chassis auf -0,5 bis 1 mm einstellen.
3) Die Spannband-Befestigungsschraube festziehen.
4) Nach Beedigung der Einstellung, den Ladevorgang (ohne eine Cassette einzusetzen) ausführen und die Position des Spannstiftes nochmals kontrollieren.

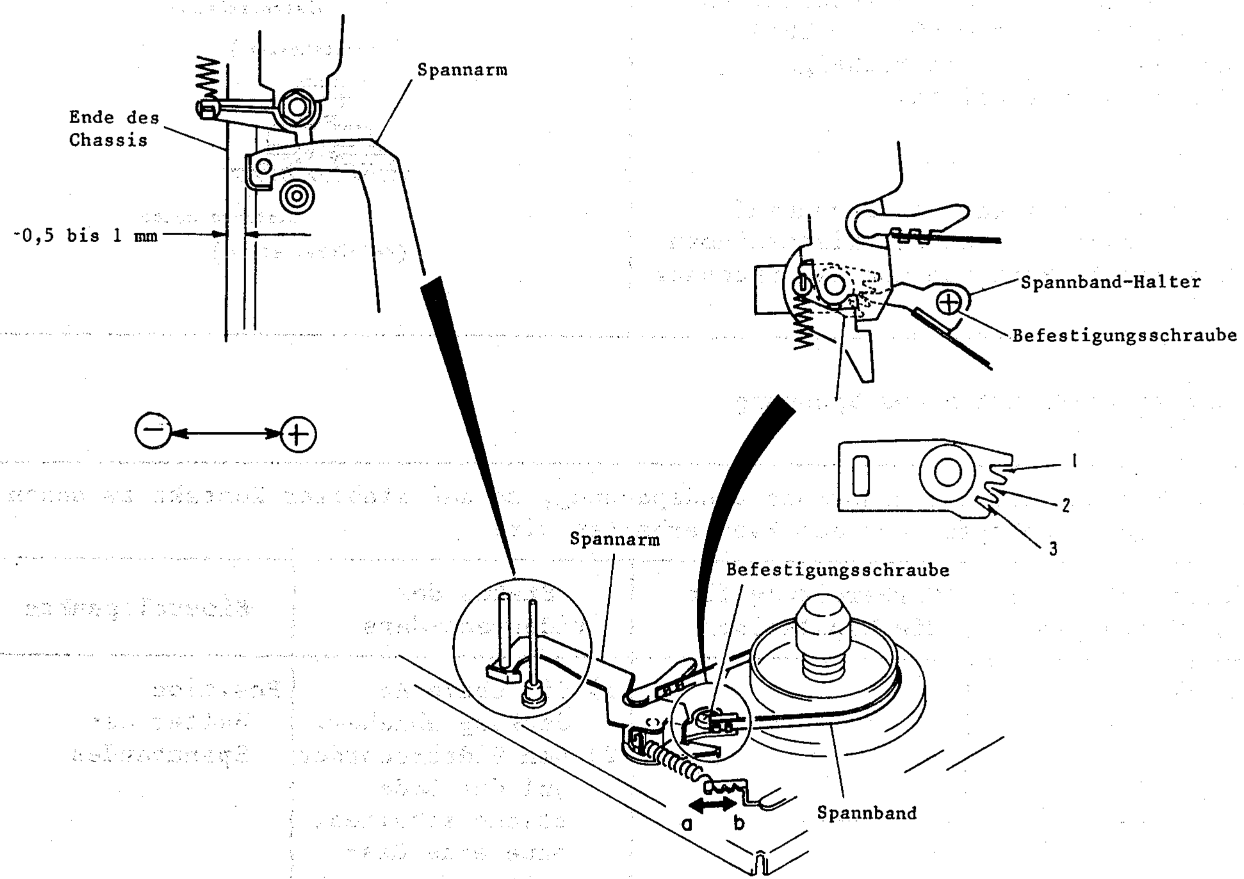
- Spannung -

Anzeige der Spanncassette:
34 bis 44 g.cm (Bezugswert)
Liegt die Anzeige über dem Bezugswert, die Feder in Richtung (a) bewegen.
Liegt die Anzeige unter dem Bezugswert, die Feder in Richtung (b) bewegen.

Vorsicht:

Falls die Spannung übermäßig geändert wurde (mehr als 6 g.cm), die Position des Spannstiftes nochmals kontrollieren. Hat sich die Spannstift-Position verschoben, die Position und die Spannung nochmals einstellen.

Einstelldiagramm


Spannarm
Ende des Chassis
-0,5 bis 1 mm
⊖
⊕
Spannband-Halter
Befestigungsschraube
1
2
3
Spannarm
Befestigungsschraube
Spannband
a
b

3. Führungsstifthöhe

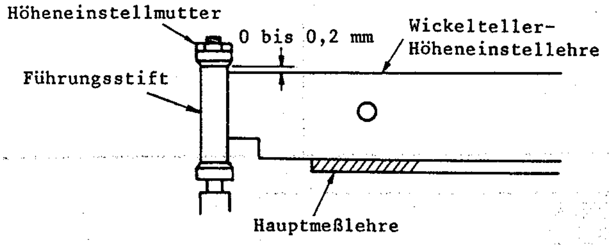
Zweck: Einstellen der Bandhöhe.

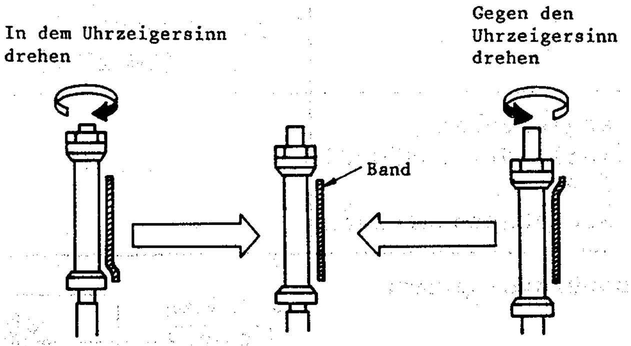
Prüfeinrichtungen/ -vorrichtungen	Vorbereitung für die Einstellung	Status des Videorecorders	Einstellpunkte
° Hauptmeßlehre (Teile-Nr. 7099279) ° Wickelteller-Höheneinstellehre (Teile-Nr. 7099038)	1) Den Cassetten-Lademechanismus ausbauen. 2) Die Hauptmeßlehre montieren und die Wickelteller-Höheneinstellehre darauf anbringen.	----	° Muttern an den Vorratsteller- und Aufwickelteller-Führungsstiften
° Leer-Kassette	----	° Wiedergabemodus	

Einstellvorgang

1) Das Spiel zwischen der Unterkante des oberen Führungsstiftflansches und der Oberkante der Wickelteller-Höheneinstellehre auf 0 bis 0,2 mm einstellen.
2) Eine Leer-Cassette einsetzen und das Bandlaufwerk einschalten; darauf achten, daß das Band nicht über dem oberen oder unteren Flansch des Führungsstiftes läuft.
3) Falls das Band über einem der Flansche läuft, die Höhe des Führungsstiftes wie folgt einstellen.
   Läuft das Band über dem oberen Flansch, die Mutter gegen den Uhrzeigersinn drehen.
   Läuft das Band über dem unteren Flansch, die Mutter in dem Uhzeigersinn drehen.

Einstelldiagramm


Höheneinstellmutter
0 bis 0,2 mm
Wickelteller-Höheneinstellehre
Führungsstift
Hauptmeßlehre


In dem Uhrzeigersinn drehen
Gegen den Uhrzeigersinn drehen
Band

4. Führungsrollenhöhe

Zweck: Einstellung der Höhe des Bandes, so daß die Bandunterkante entlang der Bandführungslinien auf der Kopftrommel transportiert wird.

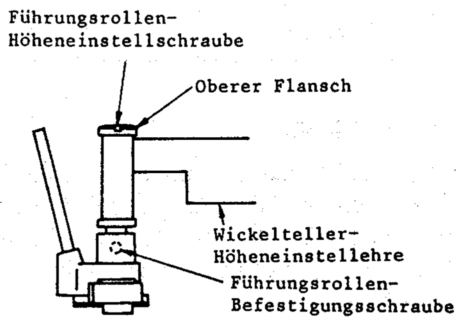
Grobeinstellung

Prüfeinrichtungen/ -vorrichtungen	Vorbereitung für die Einstellung	Status des Videorecorders	Einstellpunkte
° Hauptmeßlehre (Teile-Nr. 7099279) ° Wickelteller-Höheneinstellehre (Teile-Nr. 7099038) ° 0,9 mm Sechskantschlüssel	1) Den Kassetten-Lademechanismus ausbauen. 2) Die Hauptmeßlehre montieren und die Wickelteller-Höheneinstellehre darauf anbringen.	----	° Höheneinstellschrauben an den Vorratsteller- und Aufwickelteller-Führungsrollen

Einstellvorgang

1) Die Führungsrollen-Befestigungsschraube lösen (so daß die Führungsrolle während des Ladens, des Entladens und der Wiedergabe nicht dreht).
2) Die Unterkante des oberen Flansches der Führungsrolle mit der Oberkante der Wickelteller-Höheneinstellehre ausrichten.
3) Danach die Feineinstellung vornehmen.

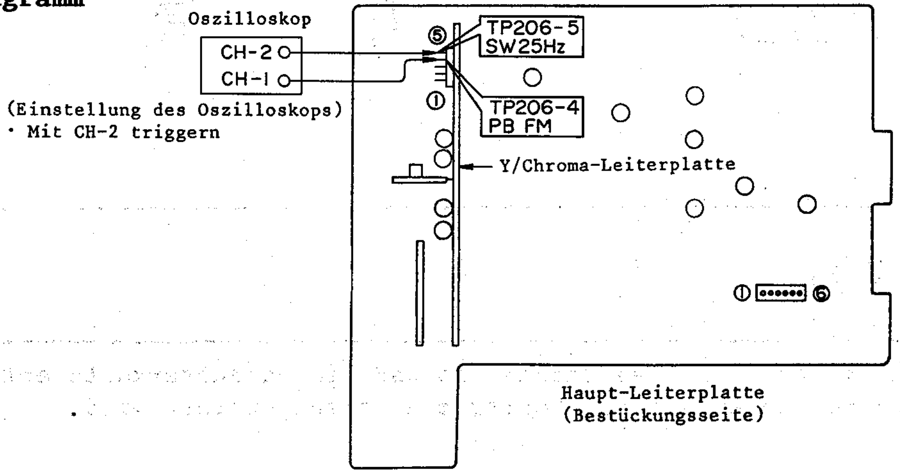
Einstelldiagramm


Führungsrollen-Höheneinstellschraube
Oberer Flansch
Wickelteller-Höheneinstellehre
Führungsrollen-Befestigungsschraube

Feineinstellung

Prüfeinrichtungen/ -vorrichtungen	Vorbereitung für die Einstellung	Status des Videorecorders	Einstellpunkte
° Oszilloskop	° CH-1: TP206-4 (PB FM) ° CH-2: TP206-5 (SW 25Hz)	° Wiedergabe des Abgleichbandes (Farbbalkensignal)	° Führungsrollen-Höheneinstellschrauben
° Abgleichband (Teile-Nr. 7099052) ° 0,9 mm Sechskantschlüssel	----		

Anschlußdiagramm


Oszilloskop
CH-2
CH-1
⑤
①
TP206-5
SW25Hz
TP206-4
PB FM
Y/Chroma-Leiterplatte
①
⑤
Haupt-Leiterplatte
(Bestückungsseite)

(Einstellung des Oszilloskops)
• Mit CH-2 triggern

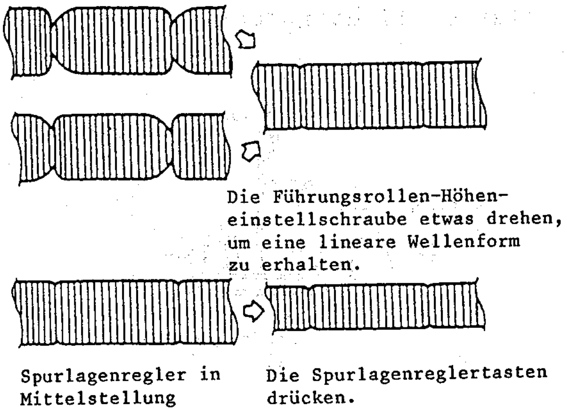
Einstellvorgang

1) Spurlagenregler: Mittelstellung (wenn dieser Abgleich nach dem Auswechseln der Kopftrommel ausgeführt wird, die Spurlage so einstellen, daß der FM-Ausgang ein Maximum aufweist)
2) Höheneinstellschraube: Auf eine lineare FM-Wellenform einstellen.
3) Die Spurlagenregler-Hoch- und -Nieder-Tasten drücken.
4) Darauf achten, daß der FM-Pegel abfällt und am Beginn sowie Ende der FM-Hüllkurve gleich ist.
5) Die Führungsrollen-Befestigungsschraube festziehen.

Hinweis: Einstellen der Spurlage in Mitte

- ° S704 (TV PROG. hoch) und S705 (TV PROG. nieder) auf der Haupt-Leiterplatte gleichzeitig drücken.

Wellenformen



Die Führungsrollen-Höheneinstellschraube etwas drehen, um eine lineare Wellenform zu erhalten.

Spurlagenregler in Mittelstellung

Die Spurlagenreglertasten drücken.

5. Audio/Synchronkopf

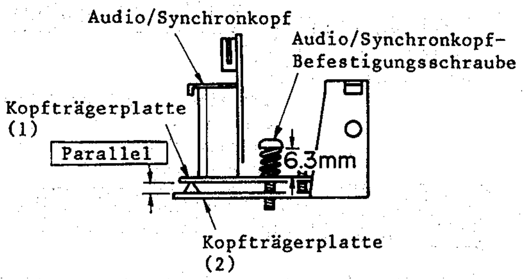
Zweck: Gleichmäßiger Kontakt zwischen dem Band und dem Audio/Synchronkopf, so daß jeweils die spezifizierte Spur bespielt bzw. abgetastet wird.

Grobeinstellung

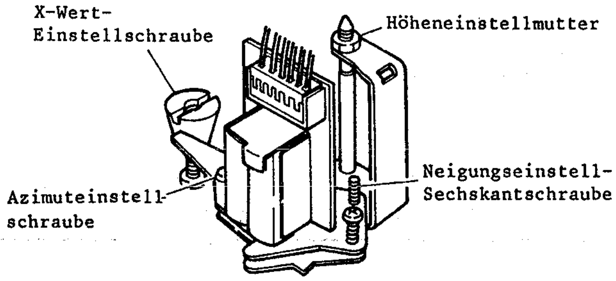
Prüfeinrichtungen/ -vorrichtungen	Vorbereitung für die Einstellung	Status des Videorecorders	Einstellpunkte
° Hauptmeßlehre (Teile-Nr. 7099279) ° Wickelteller-Höheneinstellehre (Teile-Nr. 7099038) ° 1,5 mm Sechskantschlüssel	1) Den Kassetten-Lademechanismus ausbauen. 2) Die Hauptmeßlehre montieren und die Wickelteller-Höheneinstellehre darauf anbringen.	----	° Audio/Synchronkopf-Befestigungsschraube ° Azimuteinstellschraube ° Höheneinstellmutter ° Neigungseinstellschraube
° Leer-Kassette	----	° Wiedergabe einer Leer-Cassette	

Einstellvorgang/Einstelldiagramme

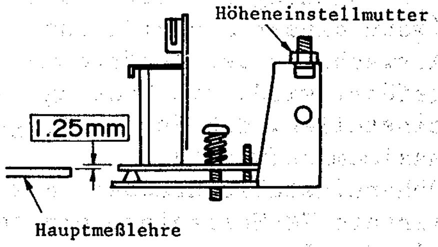
1) Audio/Synchronkopf-Befestigungsschraube: Darauf achten, daß der Federabschnitt der Audio/Synchronkopf-Befestigungsschraube um 6,3 mm an der Oberkante der Kopfträgerplatte (1) übersteht.


Audio/Synchronkopf
Audio/Synchronkopf-Befestigungsschraube
Kopfträgerplatte (1)
Parallel
6.3mm
Kopfträgerplatte (2)

2) Neigungseinstell-Sechskantschraube, Azimuteinstellschraube: Die Kopfträgerplatten (1) und (2) parallel einstellen.

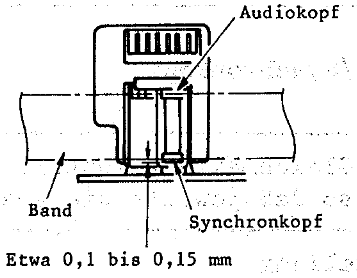

X-Wert-Einstellschraube
Höheneinstellmutter
Neigungseinstell-Sechskantschraube
Azimuteinstellschraube

3) Höheneinstellmutter: Das Spiel zwischen der Hauptmeßlehre und der Kopfträgerplatte (1) auf ca. 1,25 mm einstellen.


Höheneinstellmutter
1.25mm
Hauptmeßlehre

4) Die Einstellvorrichtungen entfernen, ein Leer-Cassette einsetzen und den Videorecorder auf den Wiedergabemodus schalten.

5) Darauf achten, daß es rund um den Audio/Synchronkopf an dem Band zu keiner Faltenbildung kommt und das Band an dem Audio/Synchronkopf nicht übersteht.
Wird Faltenbildung oder Überstand festgestellt, die Neigungseinstell-Sechskantschraube, Azimuteinstellschraube und Höheneinstellmutter nachjustieren. Wenn die Unterkante des Bandes von der Unterkante des Audio/Synchronkopf-Kerns einen Abstand von 0,1 bis 0,15 mm aufweist, dann ist die Höhe des Audio/Synchronkopfs richtig eingestellt.


Audiokopf
Band
Synchronkopf
Etwa 0,1 bis 0,15 mm

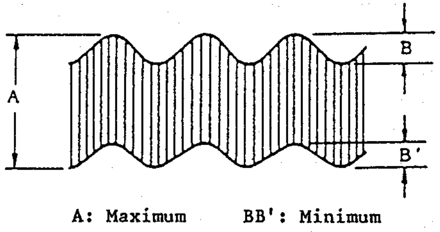
6) Danach die Feineinstellung vornehmen

Feineinstellung

Prüfeinrichtungen/ -vorrichtungen	Anschlußpunkt für Prüfeinrichtung	Status des Videorecorders	Einstellpunkte
° Oszilloskop	° J2502-1 (Audio-Ausgang)	° Wiedergabe des Abgleichbandes (Treppenstufen)	° Azimuteinstellschraube ° Höheneinstellmutter ° Neigungseinstellschraube
° Abgleichband (Teile-Nr. 7099052) ° 1,5 mm Sechskantschlüssel	----		

1) Die Azimuteinstellschraube, die Höheneinstellmutter und die Neigungseinstell-Sechskantschraube abwechselnd und in kleinen Schritten einstellen, um maximalen Audio-Ausgangspegel mit optimaler Linearität (minimale Schwankungen) zu erhalten.

Wellenform-Diagramm


A
B
B'
A: Maximum
BB': Minimum

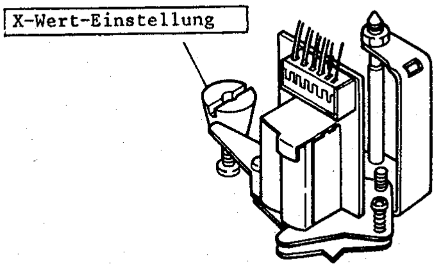
6. X-Wert

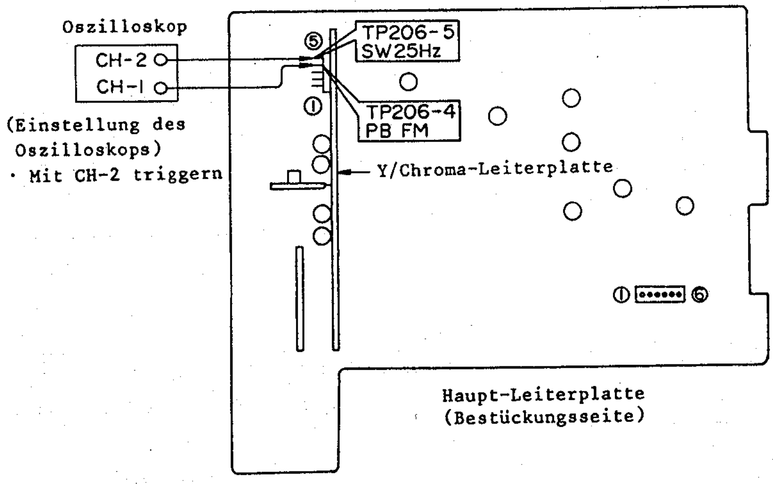
Zweck: Erreichung von Kompatibilität mit anderen Videorecorden.

Hinweis: Vor der Einstellung des X-Wertes muß immer die Spurlagen-Voreinstellung (Seite 3-2) ausgeführt werden, die nach einem Austausch der Kopftrommel erforderlich ist.

Prüfeinrichtungen/ -vorrichtungen	Anschlußpunkte für Prüfeinrichtungen	Status des Videorecorders	Einstellpunkte
° Oszilloskop	° CH-1: TP206-4 (PB FM) ° CH-2: TP206-5 (SW 25Hz)	° Wiedergabe des Abgleichbandes (Stufenwellenform)	° X-Wert-Einstelschraube
° Abgleichband (Teile-Nr. 7099052) ° 1,5 mm Sechskantschlüssel	----		

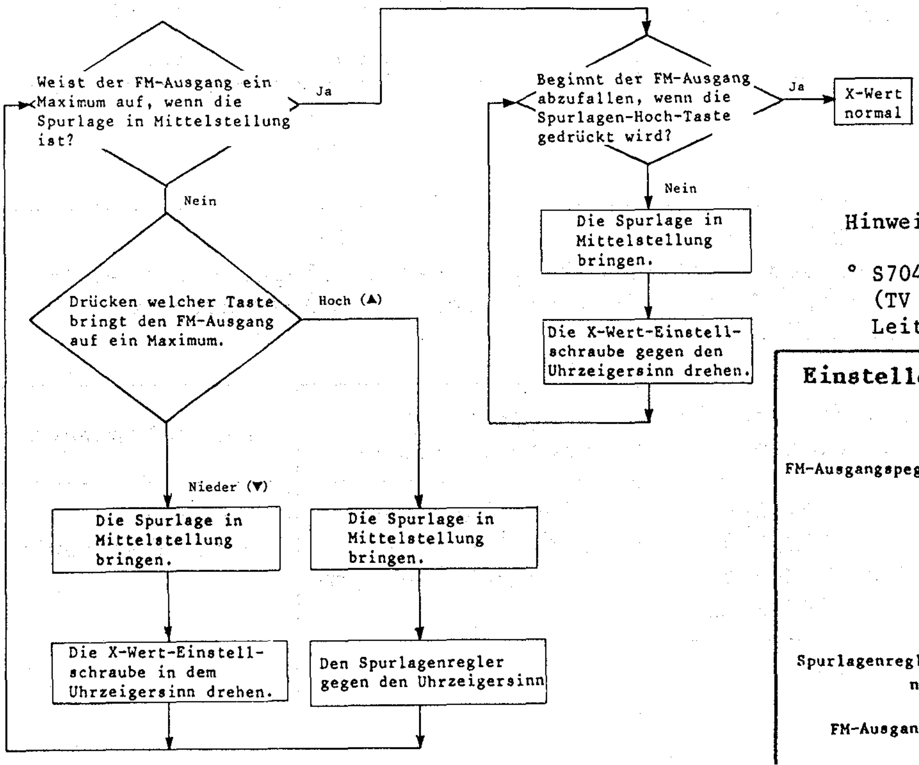
Einstellvorgang


X-Wert-Einstellung


Oszilloskop
CH-2
CH-1
(Einstellung des Oszilloskops)
· Mit CH-2 triggern
⑤
TP206-5
SW25Hz
①
TP206-4
PB FM
Y/Chroma-Leiterplatte
①
⑥
Haupt-Leiterplatte
(Bestückungsseite)

Einstellvorgang (VT-M630E)

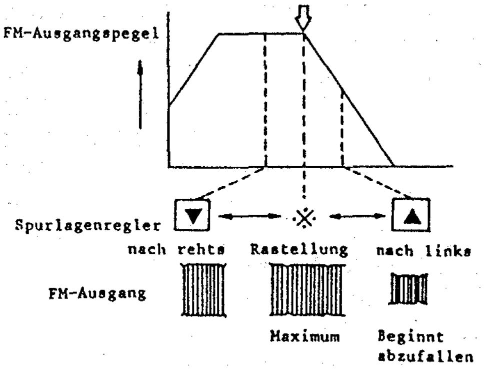
So abgleichen, daß der FM-Ausgang ein Maximum annimmt, wenn die Spurlage auf die Mittelstellung eingestellt ist, und abzufallen beginnt, wenn die Spurlagen-Hoch-Taste gedrückt wird.


Weist der FM-Ausgang ein Maximum auf, wenn die Spurlage in Mittelstellung ist?
Ja
Nein
Drücken welcher Taste bringt den FM-Ausgang auf ein Maximum.
Hoch (▲)
Nieder (▼)
Die Spurlage in Mittelstellung bringen.
Die Spurlage in Mittelstellung bringen.
Die X-Wert-Einstell-schraube in dem Uhrzeigersinn drehen.
Den Spurlagenregler gegen den Uhrzeigersinn
Beginnt der FM-Ausgang abzufallen, wenn die Spurlagen-Hoch-Taste gedrückt wird?
Ja
X-Wert normal
Nein
Die Spurlage in Mittelstellung bringen.
Die X-Wert-Einstell-schraube gegen den Uhrzeigersinn drehen.

Hinweis: Einstellen der Spurlage in Mitte

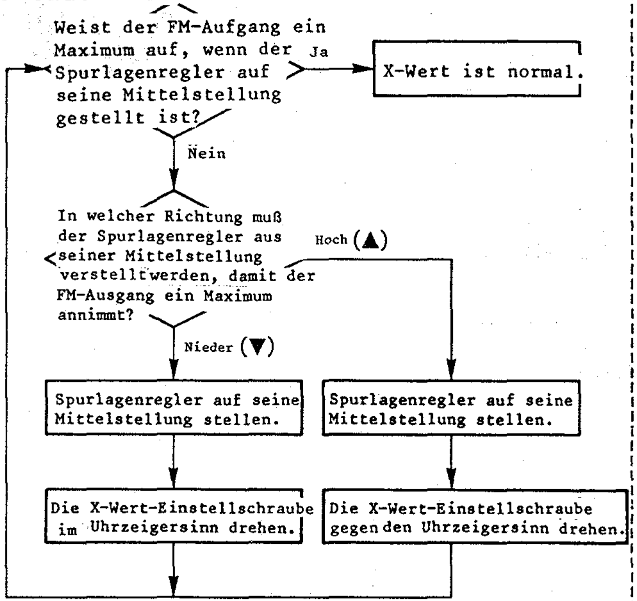
° S704 (TV PROG. hoch) und S705 (TV PROG. nieder) auf der Timer-Leiterplatte gleichzeitig drücken.

Einstelldiagramm

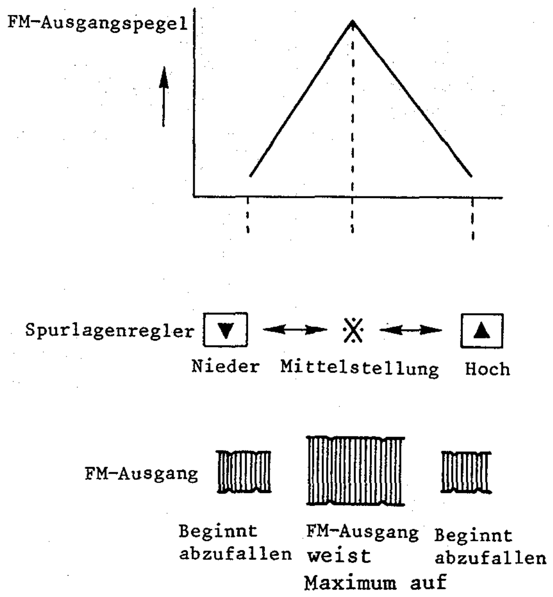

FM-Ausgangspegel
Spurlagenregler
▼
※
▲
nach rehts
Rastellung
nach links
FM-Ausgang
Maximum
Beginnt abzufallen

Abgleichvorgang (VT-M640E)

So abgleichen, das der FM-Ausgang ein Maximum aufweist, wenn der Spurlagenregler auf seine Mittelstellung gestellt ist.


Weist der FM-Aufgang ein Maximum auf, wenn der Spurlagenregler auf seine Mittelstellung gestellt ist?
Ja
X-Wert ist normal.
Nein
In welcher Richtung muß der Spurlagenregler aus seiner Mittelstellung verstellt werden, damit der FM-Ausgang ein Maximum annimmt?
Hoch (▲)
Nieder (▼)
Spurlagenregler auf seine Mittelstellung stellen.
Spurlagenregler auf seine Mittelstellung stellen.
Die X-Wert-Einstellschraube im Uhrzeigersinn drehen.
Die X-Wert-Einstellschraube gegen den Uhrzeigersinn drehen.

Abgleichdiagramm

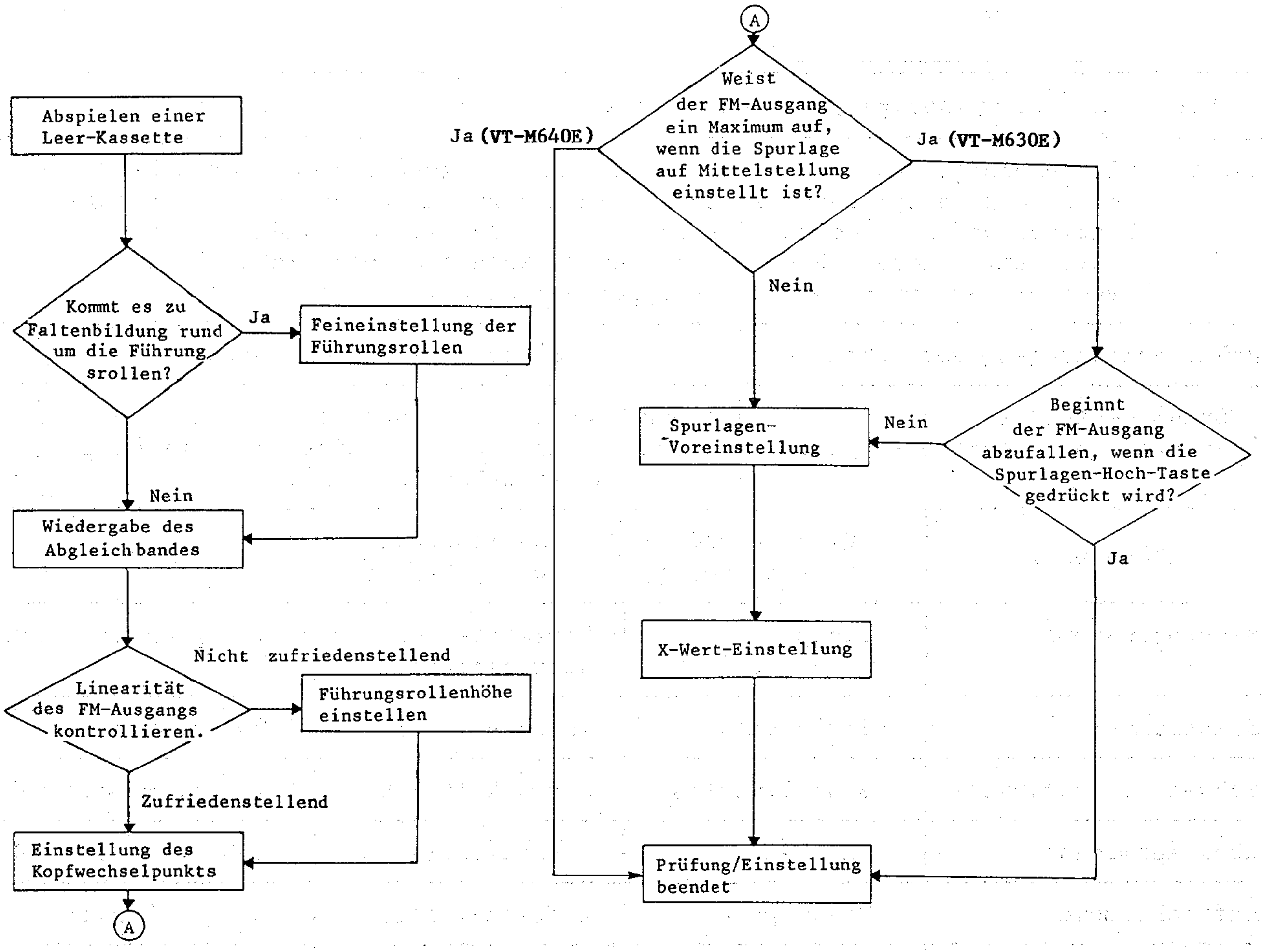

FM-Ausgangspegel
Spurlagenregler
▼
※
▲
Nieder
Mittelstellung
Hoch
FM-Ausgang
Beginnt abzufallen
FM-Ausgang weist Maximum auf
Beginnt abzufallen

7. Einstellungen nach dem Austausch der Kopftrommel (Videoköpfe)

Zweck: Vermeidung einer Höhendrift relativ zur Führungsrolle und Minimierung des X-Wertes nach dem Austauschen der Kopftrommel.

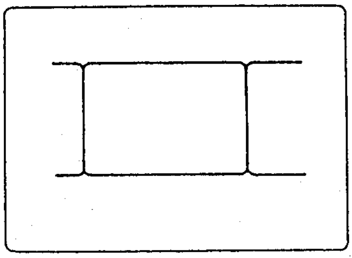
Prüfeinrichtungen/ -vorrichtungen	**Anschlußpunkte für Prüfeinrichtungen**	**Status des Videorecorders**	**Einstellpunkte**
° Oszilloskop	Kontrolle auf Linearität ° CH-1: TP206-4 (PB FM) ° CH-2: TP206-5 (SW25Hz)	° Abspielen einer Leer-Kassette	° Führungsrollen (Feineinstellung gemäß Seite 4-6) ° Kopfwechselpunkt (Seite 3-2) ° Spurlagen-Voreinstellung (Seite 3-2) ° X-Wert (Seite 4-9)
° Abgleichband (Teile-Nr. 7099052) ° Leer-Cassette ° 0,9/1,5 mm Sechskantschlüssel ° Schraubendreher für die Prüfeinrichtungen	----	° Wiedergabe des Abgleichbandes	

Prüf-/Einstellvorgang

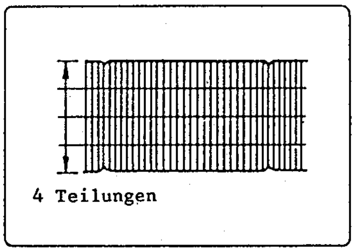

Abspielen einer Leer-Kassette
Kommt es zu Faltenbildung rund um die Führungsrollen?
Ja
Feineinstellung der Führungsrollen
Nein
Wiedergabe des Abgleichbandes
Linearität des FM-Ausgangs kontrollieren.
Nicht zufriedenstellend
Führungsrollenhöhe einstellen
Zufriedenstellend
Einstellung des Kopfwechselpunkts
A
A
Weist der FM-Ausgang ein Maximum auf, wenn die Spurlage auf Mittelstellung einstellt ist?
Ja (VT-M640E)
Ja (VT-M630E)
Nein
Spurlagen-Voreinstellung
Nein
Beginnt der FM-Ausgang abzufallen, wenn die Spurlagen-Hoch-Taste gedrückt wird?
Ja
X-Wert-Einstellung
Prüfung/Einstellung beendet

Vorgänge für die Prüfung der Linearität und Schwankungen des FM-Ausgangs und der Wellenformdiagramme

1) Den Spurlagenregler auf maximalen FM-Ausgang einstellen.

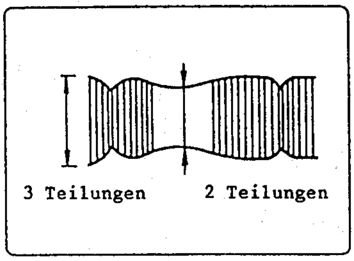


2) Eine Feinabstimmung des Spannungspegelbereiches an dem Oszilloskop vornehmen, um den FM-Ausgang auf 4 Teilungen einzustellen.



3) Die Spurlagenreglertasten drücken, um die maximale Amplitude des FM-Ausgangs auf 3 Teilungen einzustellen.

4) Sicherstellen, daß die minimale Amplitude mehr als 2 Teilungen beträgt.



5) Kontrolle der Spannungs-/Drehmomentwerte

8. Kontrolle der Spannungs-/Drehmomentwerte

Zweck: Die Spannung, das Drehmoment und die Andruckkraft an dem Aufwickelteller und an den beweglichen Teilen müssen kontrolliert werden, um richtigen Bandlauf und zufriedenstellenden Betrieb des Videorecorders sicherzustellen. Diese Prüfungen ausführen, wenn das Band nicht glatt transportiert wird oder die Bandgeschwindigkeit nicht stimmt.

Prüfeinrichtungen/-vorrichtungen	Status des Videorecorders
° Drehmomentmesser ° Adapter für Drehmomentmesser	° Den Videorecorder auf die einzelnen Betriebsarten schalten, ohne eine Cassette einzusetzen (siehe Seite 4-13).

Benennung	Videorecorder-Betriebsmodus	Zu messender Wickelteller	Meßwert
Hauptbremsmoment	Stopp (Hinweis-1)	Vorratsteller und Aufwickelteller	170 g.cm oder mehr
Spannmoment	Entladen	Vorratsteller	90 - 230 g.cm
Schnellvorlaufmoment	Schnellvorlauf	Aufwickelteller	400 g.rm oder mehr
Rücklaufmoment	Rücklauf	Vorratsteller	400 g.cm oder mehr
Aufwickelmoment	Wiedergabe	Aufwickelteller	80 - 170 g.cm
Aufspulmoment	Schnellvorlauf	Vorratsteller	4 - 25 g.cm
	Rücklauf	Aufwickelteller	

Prüfverfahren

Diese Werte sind mit Hilfe des Drehmomentmessers und des Drehmomentmesser-Adapters zu messen, wobei der Drehmomentmesser feststehen muß. (Abb. 1)

Hinweis 1:
Das Schneckenrad im Stoppmodus in richtung des Pfeiles (A) drehen und den Zeiger an dem Bandlaufwerk-Statusschalter auf "3" stellen, um die Hauptbremse an den Vorratsteller anzulegen. Danach das Schneckenrad in Richtung des Pfeiles (B) drehen, so daß der Bremsgestängearm von dem Bremsenhubarmstift freigegeben wird (das Teller-Antriebzahnrad (Zwischenrad) in Mittelstellung bringen). (Abb. 2)

Einstelldiagramm

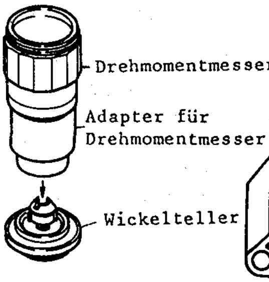


Abb. 1

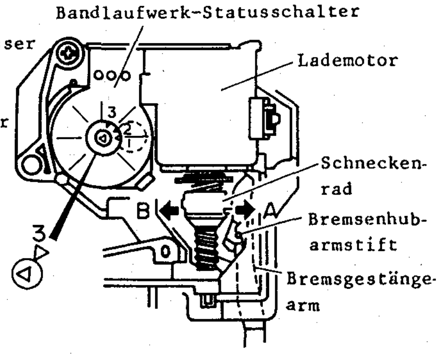


Abb. 2

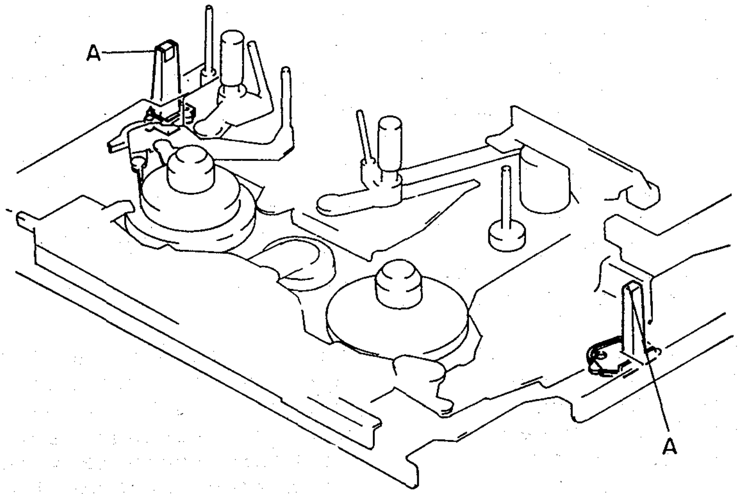
9. Um den Videorecorder auf den Lade-Status zu schalten, ohne eine Kassette einzusetzen, wie folgt vorgehen.

1) Die obere Abdeckung und die Frontplatte ausbauen.
2) Den Kassetten-Lademechanismus ausbauen.
3) Den Netzkabelstecker von der Netzdose abziehen.
4) Die Vorratsteller- und Aufwickelteller-Bandendensensoren (Abschnitt A in der Abbildung) mit schwarzem Klebeband usw. abdecken, um Lichteinfall zu unterbinden.
5) Den Netzkabelstecker wieder an eine Netzdose anschließen.
6) Den Videorecorder einschalten. In diesem Status nimmt der Videorecorder die Eingänge der einzelnen Betriebsarten an. Ein Rückspulen ist jedoch nur für einige Sekunden möglich, da sich der Aufwickelteller in dem Stoppstatus befindet und daher die Wickeltellerimpulse nicht festgestellt werden können.

Vorsichtmaßnahmen:

Nach Ausführung der obigen Operationen, den Videorecorder immer gemäß nachfolgender Beschreibung auf den Ausgangsstatus zurückstellen.

1) Das Klebeband usw. von den Vorratsteller- und Aufwickelteller-Bandendensensoren entfernen.
2) Den Netzkabelstecker von der Netzdose abziehen, um den Systemregelungs-Mikroprozessor zurückzustellen.



WARTUNGS- UND PRÜFVORGÄNGE

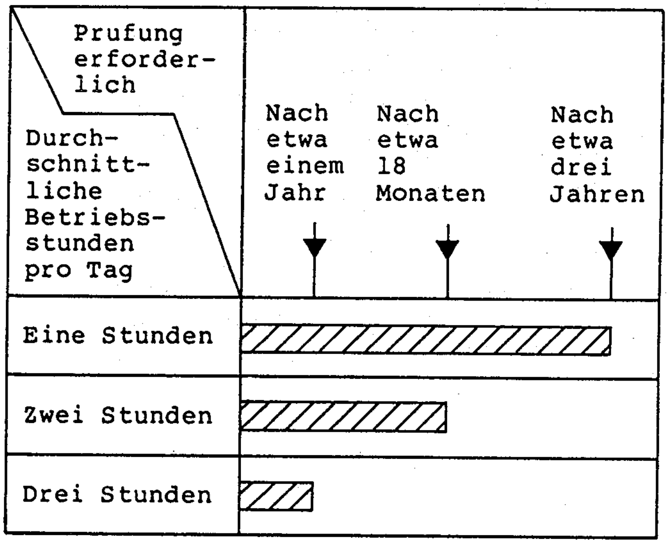
1. Erforderliche Wartung

Die Aufnahmedichte eines Videorecorders ist wesentlich höher als die eines Tonbandgerätes. Die Bauteile eines Videorecorders müssen daher mit hoher Präzision, d.h. mit einer Toleranz von nur 1/1.000 mm, hergestellt werden, um Kompatibilität mit anderen Videorecordern sicherzustellen. Falls eines dieser Bauteile verschmutzt oder abgenutzt ist, dann treten die gleichen Symptome wie bei Beschädigung eines dieser Teile auf. Um gute Bildqualität sicherzustellen, sind periodische Wartungs- und Prüfvorgänge erforderlich (einschließlich Austausch von abgenutzten Teilen und Schmierung).

2. Regelmäßige Wartung

Ein genauer Zeitplan für die Wartungs- und Prüfungsvorgänge kann nicht aufgestellt werden, da diese von der Art der Verwendung des Videorecorders durch den Anwender sowie von den Umgebungsbedingungen abhängt, unter welchen der Videorecorder eingesetzt wird. Für allgemeinen Heimgebrauch kann jedoch gesagt werden, daß die Wartungs- und Prüfvorgänge etwa alle 1.000 Betriebsstunden durchgeführt werden sollen, um gute Bildqualität zu gewährleisten. In der nachfolgenden Tabelle ist der Zusammenhang zwischen Betriebsdauer und Prüfintervallen aufgeführt.

Tabelle 1



3. Prüfungen vor Reparaturbeginn

Die folgenden Störungen können durch Reinigung und Schmierung behoben werden. Daher immer zuerst kontrollieren, ob der videorecorder gereinigt oder geschmiert werden muß.
Den Kunden befragen, wie häufig das Gerät verwendet wird. Anhand dieser Angeben ist zu bestimmen, ob die Prüf- und Wartungsvorgänge durchgeführt werden müssen. Gegebenenfalls die folgenden Prüfungen durchführen.

Tabelle 2

Problem	Prüfpunkt
Rauschen, keine Farbe	Videoköpfe verschmutzt oder abgenutzt
Bandlaufwerk arbeitet nicht oder Bandschlaufe	Andruckrolle, Wickeltellerriemen oder Schwungradriemen verschmutzt
Vertikalter Jitter, horizontaler Jitter	Videoköpfe oder Bandlaufwerk verschmutzt
Farbschlieren	Gesamtlöschkopf verschmutzt
Geringe Lautstärke oder Ton verrauscht	Audio/synchronkopf verschmutzt
Kein schneller Vor- oder Rücklauf bzw. zu geringe Bandgeschwindigkeit	Wickeltellerriemen verschmutzt

4. Werkzeuge erforderlich für Prüfung und Wartung

(1) Kopfreinigungssatz
(2) Videorecorder-Schmiermittelsatz
(3) Reinalkohol (oder Freon)
(4) Watte
(5) Schraubendreher für X-Wert-Einstellung

Tabelle 3 Fett- und Schmierpunkte bei Verwendung des Videorecorder-Schmiermittelsatzes

Schmiermittel	Schmierpunkt (Öl oder Fett)
Pan Motor Oil (X10W40)	Öl für Teile mit hoher Drehzahl
Sonic Slidas Oil (Nr. 1600)	Öl für Teile mit niedriger Drehzahl
Hitazol (MO138)	Fett für stark belastete Metallteile
Froil (GB-TS-1)	Schmiermittel für leicht belastete Metal- und Plastikteile
Sicherungslack	Sicherung der Einstellschrauben

Die obigen Öle und Fette sind in dem speziell für die Wartung des Videorecorders vorbereiteten Schmiermittelsatz enthalten. Diesen Schmiermittelsatz verwenden, wenn Schmierung erforderlich ist.

5. Wartungsvorgänge

5-1 Reinigung

(1) Reinigen der Videoköpfe

Zuerst ein Reinigungsband verwenden. Bei hartnäckig anhaftendem Schmutz, der mit Hilfe des Reinigungsbandes nicht entfernt werden kann, den Kopfreinigungssatz verwenden.
Das Reinigungsstäbchen bis zu der angegebenen Stelle mit Reinigungsflüssigkeit befeuchten. Danach das Reinigungsstäbchen leicht an den Videokopf andrücken und den Videokopf (Kopftrommel) nach links und rechts drehen. (Das Reinigungsstäbchen nicht vertikal bewegen und darauf achten, daß nur das Wildleder des Reinigungsstäbchens den Videokopf berührt, da anderenfalls der Videokopf beschädigt werden kann.)

Den Videokopf anschließend vollständig trocknen. Danch einen Probelauf mit einem Magnetband ausführen. Falls Reinigungsflüssigkeit auf dem Videokopf verbleibt, könnte das Magnetband beschädigt werden, wenn es mit dem Videokopf in Berührung kommt.

(2) Reinigen des Bandlaufwerkes, Antriebssystems usw.

Mit einem in Reinalkohol oder Freon angefeuchteten Wattebausch abwischen.

Hinweise:
1) Das Bandlauferk enthält alle Teile, die mit dem Magnetband in Berührung kommen. Das Antriebssystem umfaßt dagegen alle Teile, die für den Antrieb des Magnetbandes dienen.
2) Bei der Reinigung ist darauf zu achten, daß die Teile des Bandlaufwerkes nicht mit metallischen Gegenständen (Schraubendreher usw.) berührt werden; weiters dürfen keine übermäßige Kräfte auf das Bandlaufwerk ausgeübt werden, da es sonst zu Verformungen kommen kann.

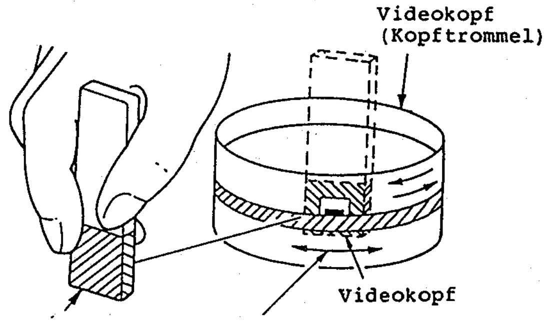
5-2 Ölschmierung

(1) Richtlinien für die Ölschmierung

Eine Ölkanne verwenden, um ein oder zwei Tropfen Schmieröl ("Pan Motor Oil" oder "Sonic Slidas Oil") aufzutragen. Niemals zu viel Öl auftragen, da dieses sonst auf andere drehende Teile gelangen und Schlupf verursachen kann. Falls zu viel Öl aufgetragen wurde, das überschüssige Öl mit Reinalkohol oder Freon abwischen.

(2) Regelmäßige Ölschmierung

Öl alle 1.000 Betriebsstunden auf den vorgeschriebenen Punkten auftragen.


Videokopf (Kopftrommel)
Videokopf
Reinigungsflüssigkeit auftragen
Das Wildleder des Reinigungsstäbchens an den Videokopf anlegen und den Videokopf vorsichtig drehen

5-3 Fettschmierung

(1) Richtlinien für die Fettschmierung

Schmierfett ("Hitazol" oder "Froil") mit einem Stäbchen oder Pinsel auftragen. Jedoch nicht zu viel Fett verwenden, da dieses sonst auf Teile des Bandlaufwerkes oder Antriebssystems gelangen kann. Überschüssiges Fett mit einem in Reinalkohol oder Freon augefeuchteten Wattebausch abwischen.

(2) Regelmäßige Fettschmierung

Fett alle 5.000 Betriebsstunden auf den vorgeschriebenen Punkten auftragen.

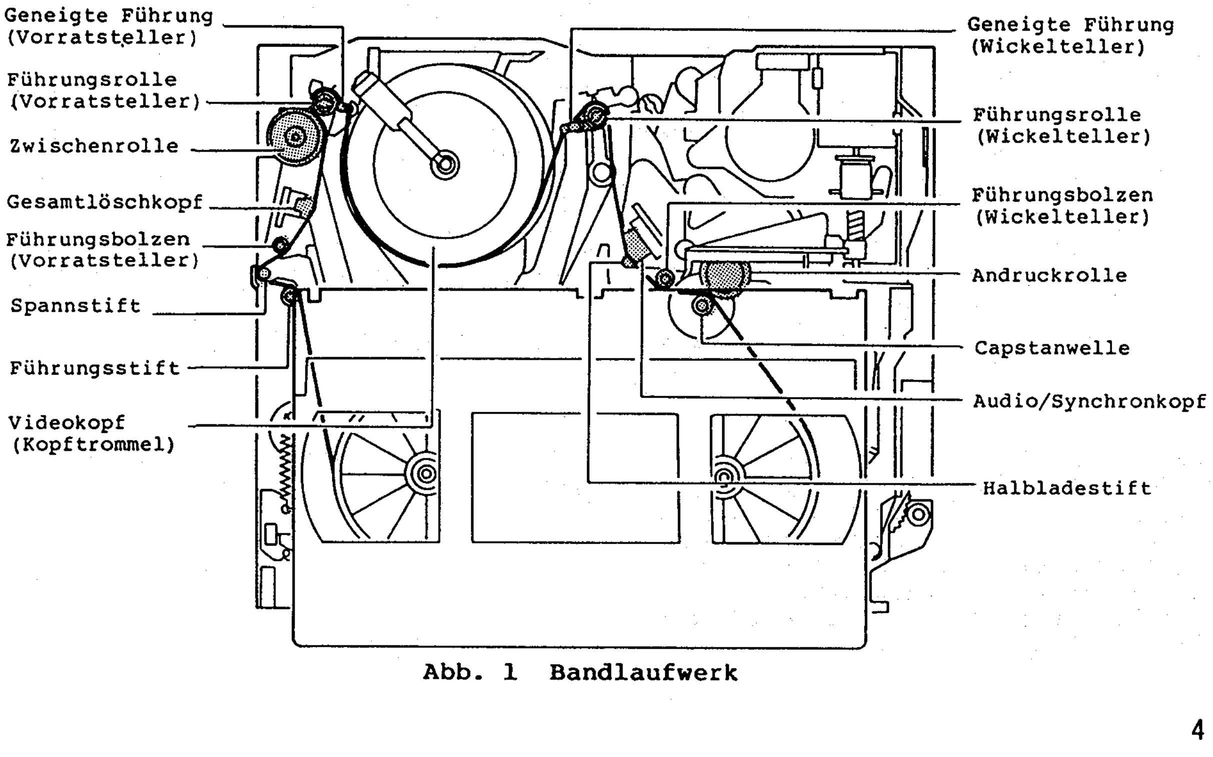

Geneigte Führung (Vorratsteller)
Führungsrolle (Vorratsteller)
Zwischenrolle
Gesamtlöschkopf
Führungsbolzen (Vorratsteller)
Spannstift
Führungsstift
Videokopf (Kopftrommel)
Geneigte Führung (Wickelteller)
Führungsrolle (Wickelteller)
Führungsbolzen (Wickelteller)
Andruckrolle
Capstanwelle
Audio/Synchronkopf
Halbladestift

Abb. 1 Bandlaufwerk

6. Prüfpunkte

	Problem	Prüfpunkt	Erneuern
①	Farbschlieren	Gesamtlöschkopf verschmutzt	
②	Rauschen, keine Farbe	Videokopf verschmutzt	○
③	Vertikaler Jitter	Bandlaufwerk verschmutzt Videokopf verschmutzt	
④	Geringe Lautstärke, verzerrter Klang	Audio/Synchronkopf verschmutzt	○
⑤	Band wird nicht transportiert. Bandschlaufe	Andruckrolle verschmutzt	○

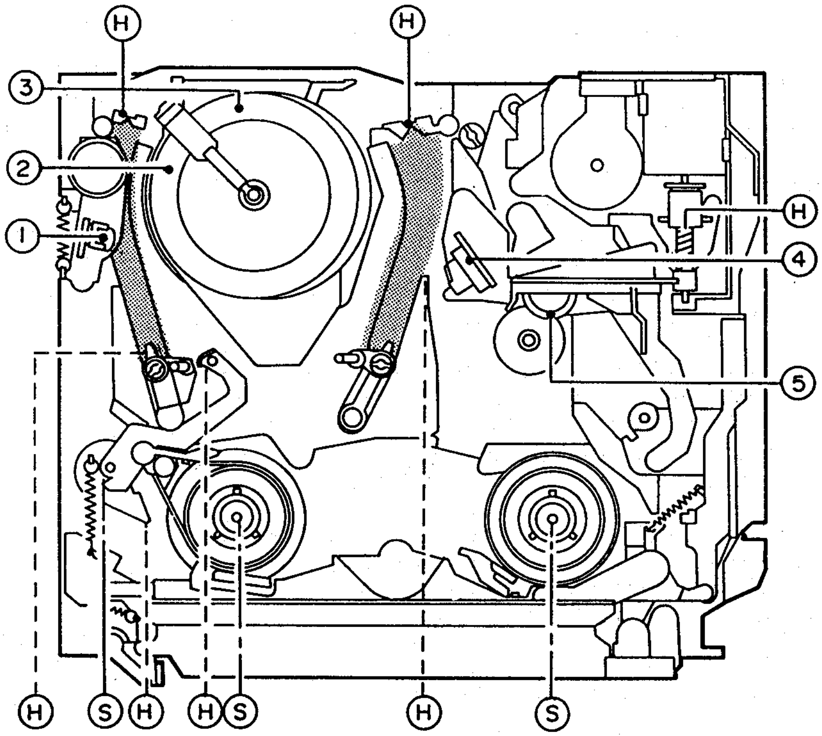


Abb. 2 Draufsicht auf Bandlaufwerk

Problem	Prüfpunkt	Erneuern
Keine schneller Vor- oder Rücklauf bzw. Bandlaufgeschwindigkeit zu nieder Bandlaufwerk arbeitet nicht Bandschlaufe	Wickeltellerriemen verschmutzt	○

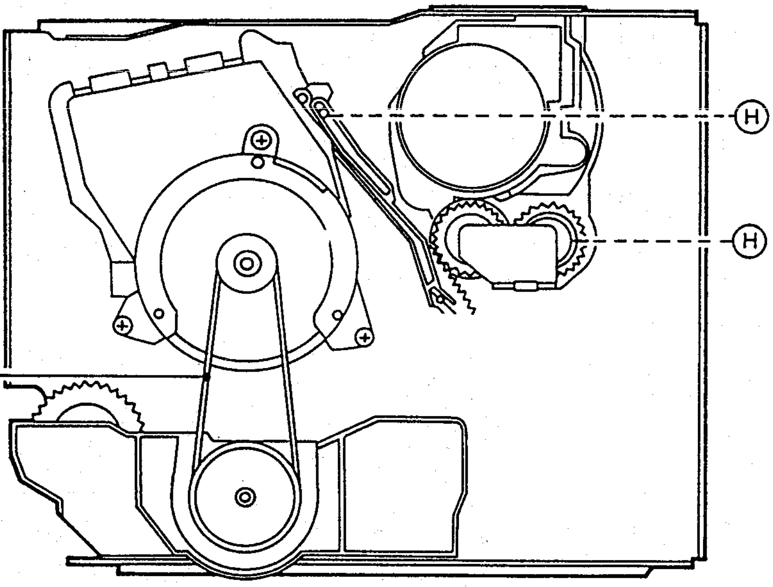


Abb. 3 Unteransicht des Bandlaufwerkes

Hinweis:

Falls die mit "o" bezeichneten Teile nach der Schmierung nicht richtig arbeiten, dann liegt Abnutzung vor, so daß diese Teile erneuert werden müssen. Für die Schmierpunkte (Öl oder Fett) siehe die auseinandergezogenen Darstellungen am Ende dieser Anleitung sowie die obigen Abbildungen.

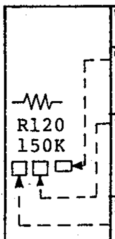
Ⓢ : Sonic Slidas Oil (Ölschmierung)
Ⓗ : Froil (Fettschmierung)

SCHALTPLAN/LEITERPLATTEN-DIAGRAMM

Vor der Verwendung dieses Wartungs-Referenzmaterials

Ablesen der Abkürzungen

(Widerstände)

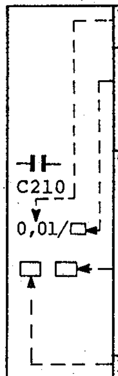


Wert	Keine Angabe .. Ohm K .... kOhm
Toleranz	Keine Angabe .. ±5% K .... ±10% M .... ±20%
Wattzahl	Keine Angabe .. 1/8W (Alle Werte anders als 1/8W sind in den Schaltplänen ohne W angegeben.)
Bauart	Keine Angabe .. Kohlefilm RC .... Massivkohle RW .... Drahtspule RS .... Metalloxidfilm RN .... Metallfilm

Beispiel:

R120 ..... 150 kOhm, Massivkohle
RC1/2K 1/2W, ±10%

(Kondensatoren)



Wert	Keine Angabe .. µF P .... PF
Dielektrizitätsfestigkeit	Keine Angabe ... 50 WV (Alle Werte anders als 50 WV und Elektrolyt-Kondensatoren sind in den Schaltplänen ohne WV angegeben.)
Toleranz	Keine Angabe ... ±10% J .... ±5% M .... ±20% C .... ±0,25PF Z .... +80% -20% (Keine Toleranz ist angegeben für Elektrolyt-Kondensatoren (ausgenommen Tantal-und hochstabile Elektrolyt-Kondensatoren).)
Bauart	Keinen Angabe ... Keramik Allgemeine Elektrolyt-Kondensatoren (mit Schaltkreis-Symbol von Keramik-Kondensatoren unterschieden) MYL .... Mylar (Polyesterfilm) STY .... Styrol TA .... Tantal KU .... Hochstabiler Elektrolyt MP .... Metallisiertes Papier

Beispiel:

C210
0,01/25 ... Mylar, 0,01 µF, 25WV, ±5%
MYL J

Hinweise:

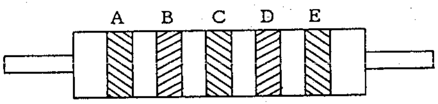
1. Die aufgeführten Spannungswerte wurden mit der negativen (-) Klemme der Stromversorgung als Referenz im normalen Betriebsmodus gemessen. Die Spannungen in unterschiedlichen Modi sind in den Schaltplänen angegeben; solche in Klammern ( ) gelten für den Aufnahmemodus und solche ohne Klammern für den Wiedergabemodus.
2. Wert, Dielektrizitätsfestigkeit (Wattzahl), Toleranz und Bauart der Widerstände (ausgenommen Regelwiderstände usw.) und Kondensatoren sind in den Schaltplänen mit Abkürzungen angegeben. Diese Komponenten richtig austauschen, wobei die Abkürzungen in den Schaltplänen mit denen in der Tabelle "Ablesen der Abkürzungen" zu vergleichen sind.

Vorsichtsmaßnahmen bei der Verwendung von MOC-ICs

1. Die MOS-ICs werden für den Versand in schwarzem Schaumstoff verpackt. Dieser Schaumstoff ist elektrisch leitend und schließt die Leiter kurz, um Beschädigungen zu vermeiden. Die ICs während der Lagerung niemals aus der Schaumstoffverpackung entfernen. Die ICs nur unmittelbar vor der Verwendung auspacken und niemals auf Plastikteilen ablegen (statische Elektrizität!) bzw. in Styrol-Schaumstoff einsetzen.
2. Aufgrund von Leckagen am Lötkolben kann es während des Lötens zu Hochspannungen kommen; daher immer die Spitze des Lötkolbens erden und nur einen Niederspannungs-Lötkolben verwenden.
3. Statische Elektrizität von einigen tausend Volt kann sich aufgrund von Reibung im menschlichen Körper bzw. in aus Kunstfasern hergestellten Kleidern und Handschuhen aufbauen. Daher sollten auch die mit der Handhabung von ICs betrauten Personen geerdet werden.
4. Unbedingt die für die Reparaturen verwendeten Meßinstrumente wie Oszilloskop, Röhrenvoltmeter usw. erden.

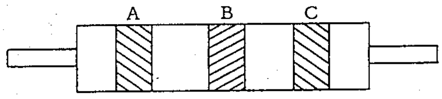
Ablesen der Kapazität und Induktivität der in Form von Widerständen ausgeführten Kondensatoren und Spulen

Kondensator



Kapazität: (10A+B) x C (pF)
Toleranz: D
Nennspannung: Farbe Rosa: 25V
Grün: 50V
Kennlinie: E

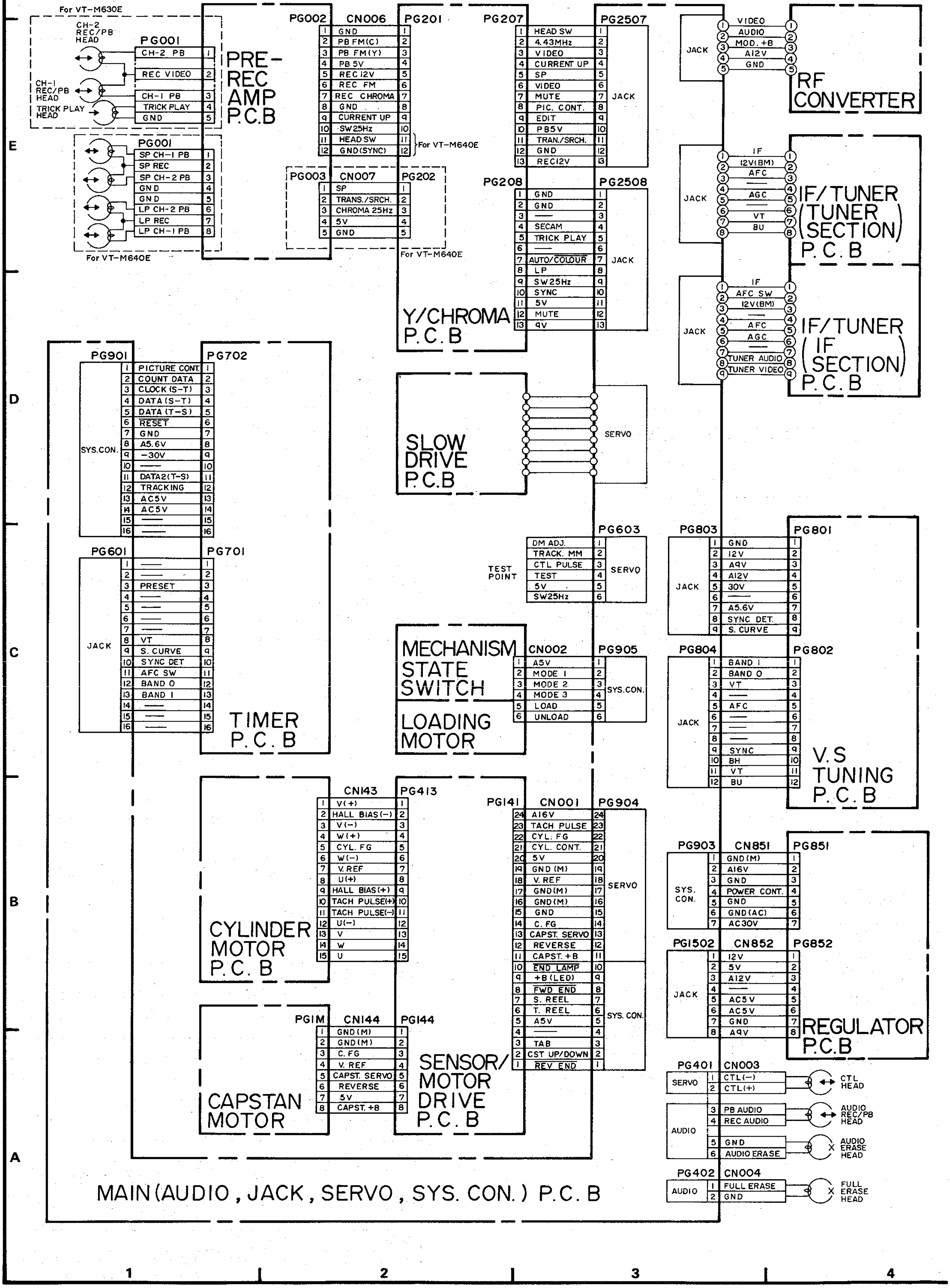
Spule



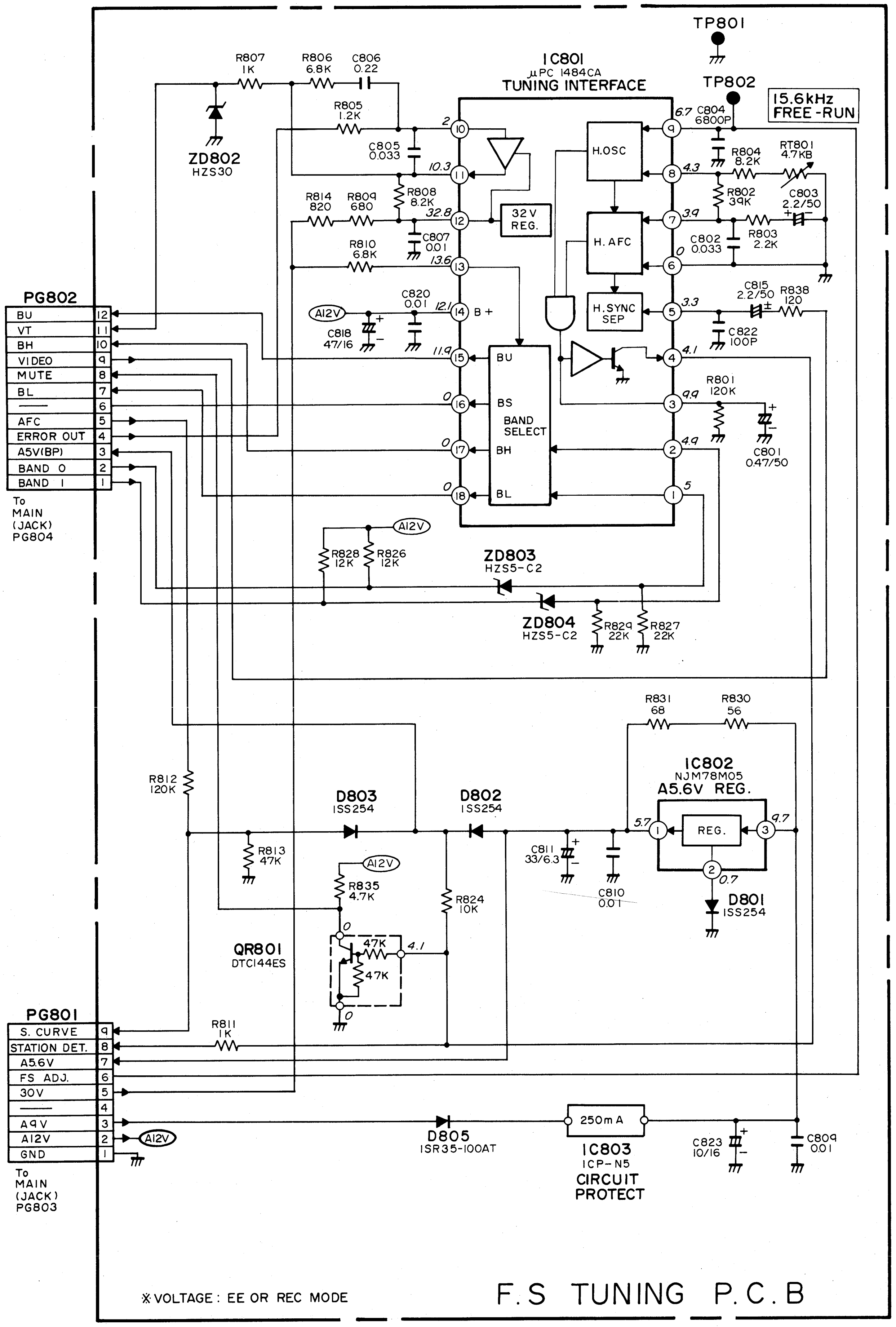
Induktivität: (10A+B) x C (µH)

Farbe	A,B	C	D	E
Schwarz	0	10^0	±20%	Für Temperatur-Kompensation
Braun	1	10^1		
Rot	2	10^2		
Orange	3	10^3		
Gelb	4	10^4		
Grün	5	10^5		
Blau	6			
Violett	7			
Grau	8		±30%	Bauart mit hoher Dielektrizitätskonstanter
Weiß	9			Für Temperatur-Kompensation
Gold		10^{-1}	±5%	
Silber		10^{-2}	±10%	Bauart mit hoher Dielektrizitätskonstanter

INTERNAL WIRING DIAGRAM
(KABELAN SCHLUSS DIAGRAM)


For VT-M630E
CH-2 REC/PB HEAD
CH-1 REC/PB HEAD
TRICK PLAY HEAD
PG001
CH-2 PB
REC VIDEO
CH-1 PB
TRICK PLAY
GND
PG001
SP CH-1 PB
SP REC
SP CH-2 PB
GND
GND
LP CH-2 PB
LP REC
LP CH-1 PB
For VT-M640E
PRE-REC AMP P.C.B
PG002
CN006
PG201
GND
PB FM(C)
PB FM(Y)
PB 5V
REC 12V
REC FM
REC CHROMA
GND
CURRENT UP
SW25Hz
HEAD SW
GND(SYNC)
For VT-M640E
PG003
CN007
PG202
SP
TRANS./SRCH.
CHROMA 25Hz
5V
GND
For VT-M640E
PG207
PG2507
HEAD SW
4.43MHz
VIDEO
CURRENT UP
SP
VIDEO
MUTE
PIC. CONT.
EDIT
PB5V
TRAN./SRCH.
GND
REC12V
JACK
PG208
PG2508
GND
GND
SECAM
TRICK PLAY
AUTO/COLOUR
LP
SW25Hz
SYNC
5V
MUTE
9V
JACK
Y/CHROMA P.C.B
JACK
VIDEO
AUDIO
MOD. +B
A12V
GND
RF CONVERTER
JACK
IF
12V(BM)
AFC
AGC
VT
BU
IF/TUNER (TUNER SECTION) P.C.B
JACK
IF
AFC SW
12V(BM)
AFC
AGC
TUNER AUDIO
TUNER VIDEO
IF/TUNER (IF SECTION) P.C.B
PG901
PG702
PICTURE CONT.
COUNT DATA
CLOCK (S-T)
DATA (S-T)
DATA (T-S)
RESET
GND
A5.6V
-30V
DATA2(T-S)
TRACKING
AC5V
AC5V
SYS.CON.
PG601
PG701
PRESET
VT
S. CURVE
SYNC DET
AFC SW
BAND 0
BAND 1
JACK
TIMER P.C.B
SLOW DRIVE P.C.B
SERVO
TEST POINT
PG603
DM ADJ.
TRACK. MM
CTL PULSE
TEST
5V
SW25Hz
SERVO
MECHANISM STATE SWITCH
LOADING MOTOR
CN002
PG905
A5V
MODE 1
MODE 2
MODE 3
LOAD
UNLOAD
SYS.CON.
PG803
PG801
GND
12V
A9V
A12V
30V
A5.6V
SYNC DET.
S. CURVE
JACK
PG804
PG802
BAND 1
BAND 0
VT
AFC
SYNC
BH
VT
BU
JACK
V.S TUNING P.C.B
CN143
PG413
V(+)
HALL BIAS(-)
V(-)
W(+)
CYL. FG
W(-)
V.REF
U(+)
HALL BIAS(+)
TACH PULSE(+)
TACH PULSE(-)
U(-)
V
W
U
CYLINDER MOTOR P.C.B
PG141
CN001
PG904
A16V
TACH PULSE
CYL. FG
CYL. CONT.
5V
GND (M)
V. REF
GND(M)
GND(M)
GND
C. FG
CAPST. SERVO
REVERSE
CAPST. +B
END LAMP
+B (LED)
FWD END
S. REEL
T. REEL
A5V
TAB
CST UP/DOWN
REV END
SERVO
SYS. CON.
PG1M
CN144
PG144
GND (M)
GND(M)
C. FG
V. REF
CAPST. SERVO
REVERSE
5V
CAPST. +B
CAPSTAN MOTOR
SENSOR/ MOTOR DRIVE P.C.B
PG903
CN851
PG851
GND (M)
A16V
GND
POWER CONT.
GND
GND (AC)
AC30V
SYS. CON.
PG1502
CN852
PG852
12V
5V
A12V
AC5V
AC5V
GND
A9V
JACK
REGULATOR P.C.B
PG401
CN003
SERVO
CTL(-)
CTL(+)
CTL HEAD
AUDIO
PB AUDIO
REC AUDIO
AUDIO REC/PB HEAD
GND
AUDIO ERASE
AUDIO ERASE HEAD
PG402
CN004
AUDIO
FULL ERASE
GND
FULL ERASE HEAD
MAIN (AUDIO, JACK, SERVO, SYS. CON.) P.C.B
E
D
C
B
A
1
2
3
4

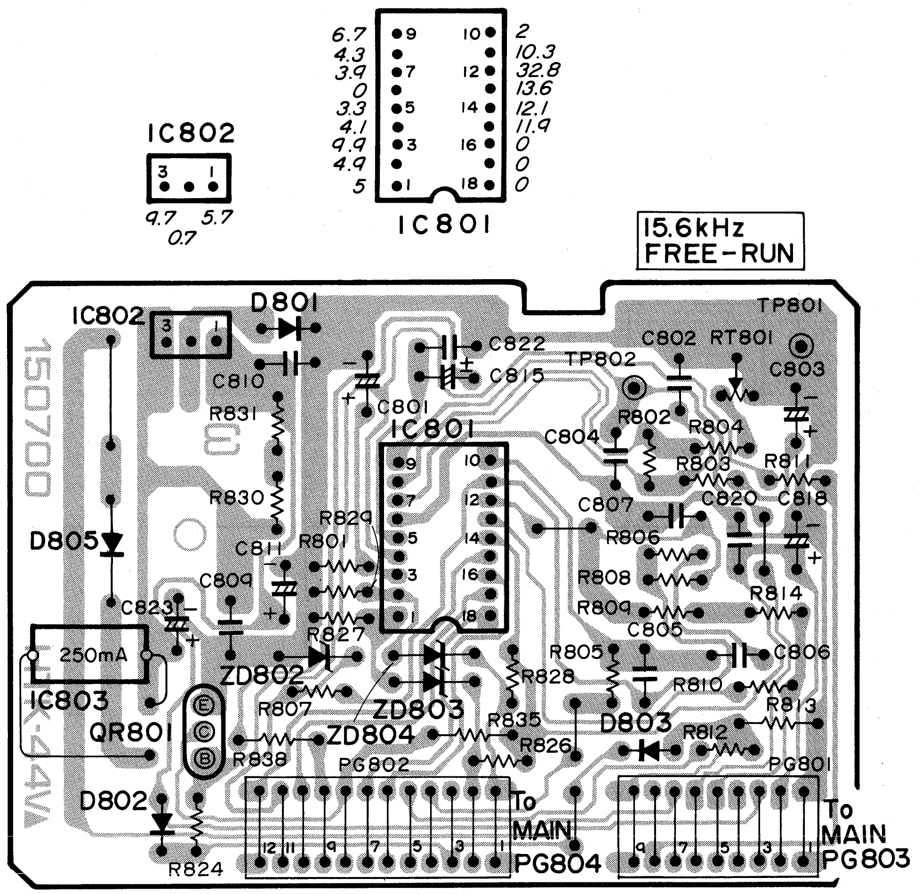
FS TUNING SCHEMATIC DIAGRAM
(FREQUENZ-SYNTHESIZER-TUNER)


TP801
TP802
15.6kHz FREE-RUN
IC801 μPC 1484CA TUNING INTERFACE
H.OSC
H. AFC
H. SYNC SEP
32V REG.
BAND SELECT
B +
BU
BS
BH
BL
R807 1K
R806 6.8K
C806 0.22
R805 1.2K
C805 0.033
ZD802 HZS30
R814 820
R809 680
R808 8.2K
R810 6.8K
C807 0.01
C820 0.01
C818 47/16
A12V
C804 6800P
R804 8.2K
RT801 4.7KB
R802 39K
C803 2.2/50
C802 0.033
R803 2.2K
C815 2.2/50
R838 120
C822 100P
R801 120K
C801 0.47/50
PG802
BU
VT
BH
VIDEO
MUTE
BL
AFC
ERROR OUT
A5V(BP)
BAND 0
BAND 1
To MAIN (JACK) PG804
R828 12K
R826 12K
ZD803 HZS5-C2
ZD804 HZS5-C2
R829 22K
R827 22K
R831 68
R830 56
IC802 NJM78M05 A5.6V REG.
REG.
R812 120K
D803 1SS254
D802 1SS254
R813 47K
C811 33/6.3
C810 0.01
D801 1SS254
A12V
R835 4.7K
R824 10K
QR801 DTC144ES
47K
47K
PG801
S. CURVE
STATION DET.
A5.6V
FS ADJ.
30V
A9V
A12V
GND
To MAIN (JACK) PG803
R811 1K
D805 1SR35-100AT
250mA
IC803 ICP-N5 CIRCUIT PROTECT
C823 10/16
C809 0.01

※VOLTAGE : EE OR REC MODE

F.S TUNING P.C.B

FS TUNING CIRCUIT BOARD DIAGRAM
(FREQUENZ-SYNTHESIZER-TUNER)

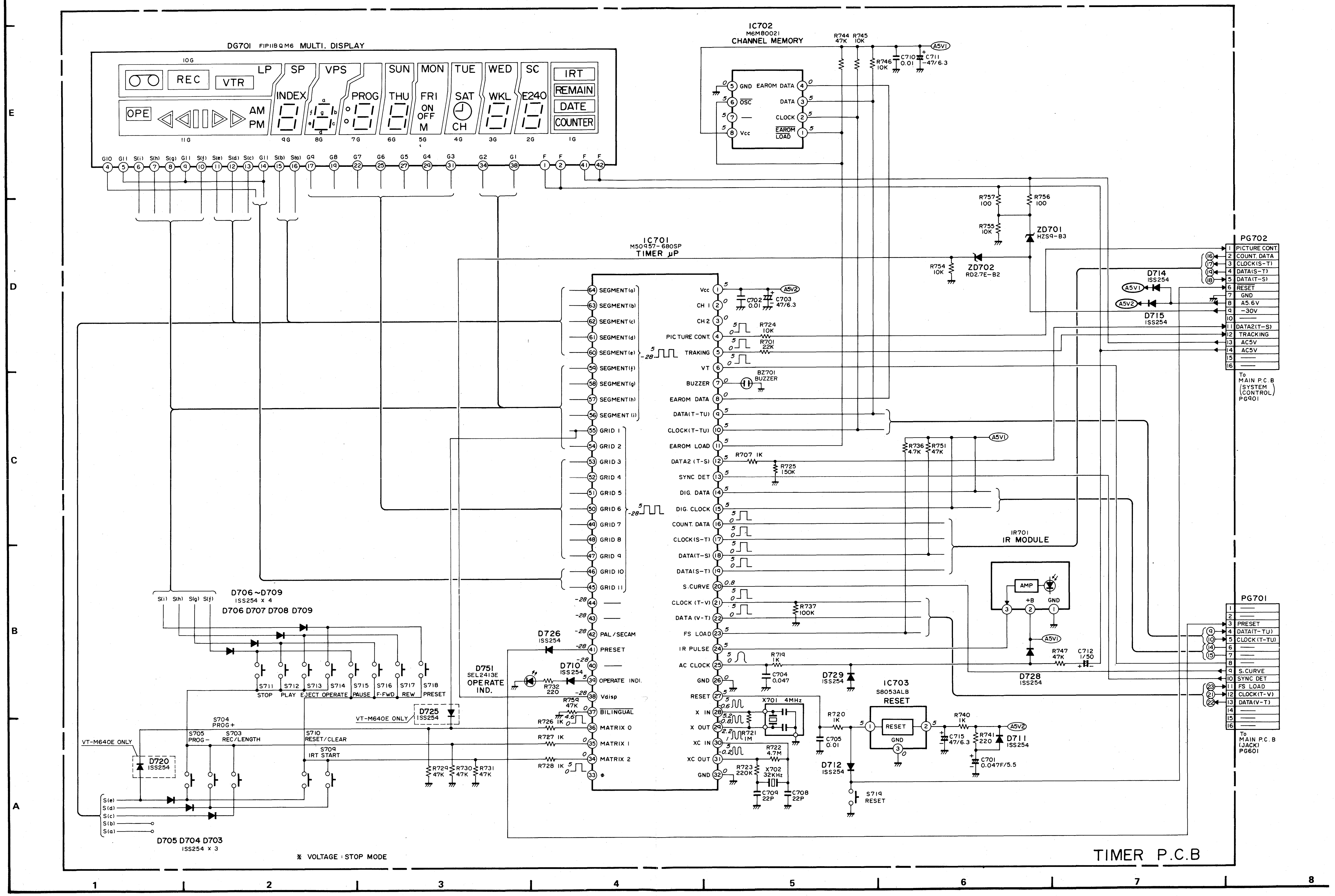

IC802
IC801
15.6kHz FREE-RUN
D801
C810
C822
C815
C801
TP802
TP801
C802
RT801
C803
R831
R830
R829
R801
C811
C809
C823
D805
250mA
IC803
QR801
D802
R824
R838
R807
ZD802
R827
ZD803
ZD804
R835
R826
R828
R805
C805
D803
R812
R810
R813
C806
R814
R809
R808
R806
C807
C820
C818
R811
R803
R804
R802
C804
PG802
PG801
To MAIN PG804
To MAIN PG803
150700

F.S TUNING P.C.B

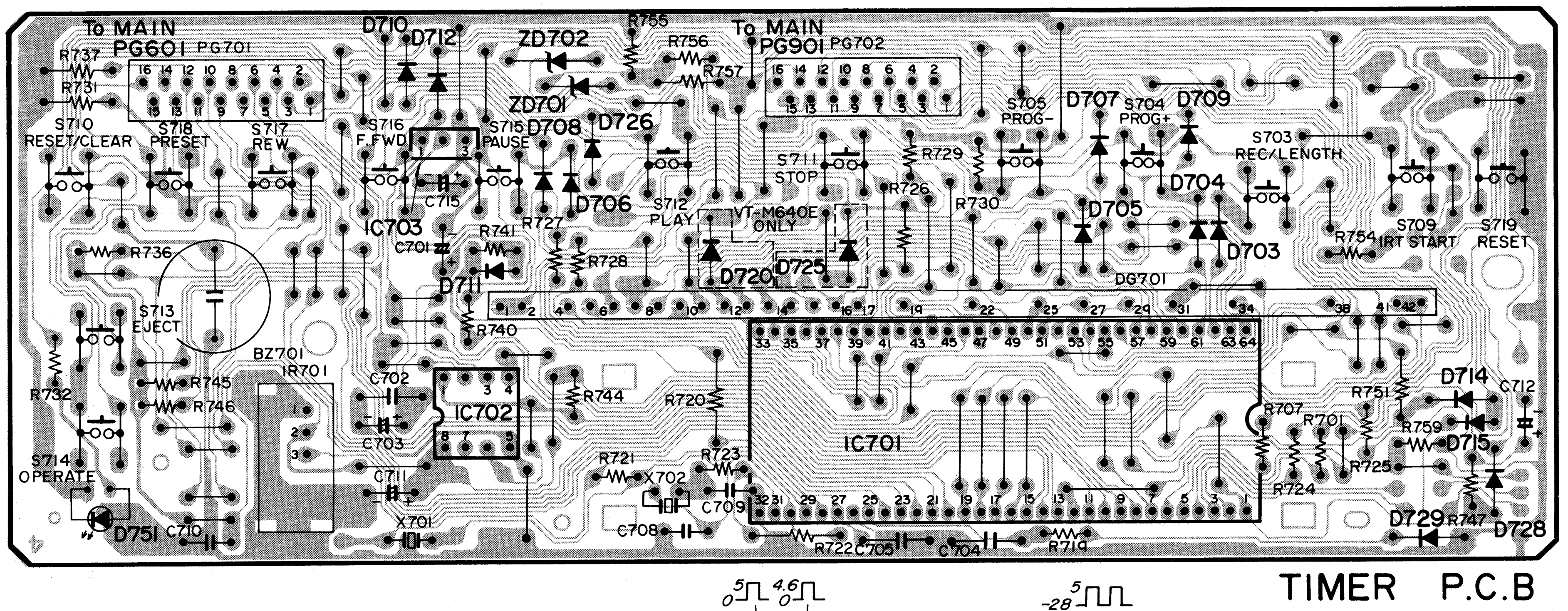
※VOLTAGE : EE OR REC MODE

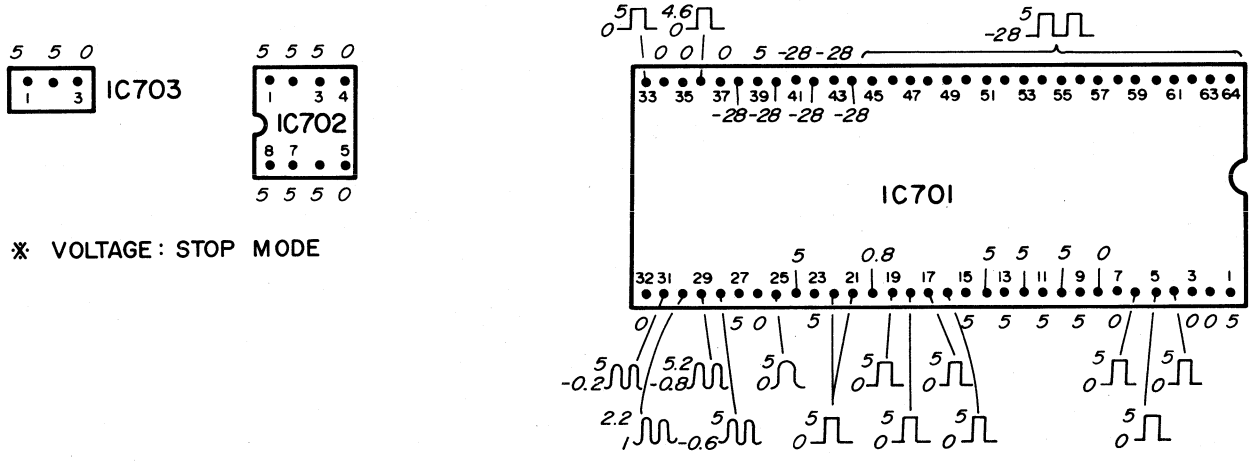
DIAGRAM CONFIGURATION	SCHEMATIC	CIRCUIT BOARD
F.S TUNING	5-3	/5-4
TIMER	5-5	/5-7
JACK	5-9	/5-19,23
AUDIO	5-11	/5-19,23
SLOW DRIVE	5-12	/5-12
SERVO	5-13	/5-19,23
SENSOR/MOTOR DRIVE	5-15	/5-16
CAPSTAN MOTOR DRIVE	5-16	/
SYSTEM CONTROL	5-17	/5-19,23
PRE-REC AMP	5-21	/
Y/CHROMA	5-25	/5-27
REGULATOR	5-29	/5-29
REMOTE CONTROL	5-31	/
IF UNIT	5-32	/
TUNER UNIT	5-33	/
RF CONVERTER	5-35	/

TIMER SCHEMATIC DIAGRAM (TIMER)


DG701 FIP11BQM6 MULTI. DISPLAY
IC702 M6M80021 CHANNEL MEMORY
IC701 M50957-680SP TIMER µP
IC703 S8053ALB RESET
IR701 IR MODULE
PG702
PICTURE CONT.
COUNT. DATA
CLOCK(S-T)
DATA(S-T)
DATA(T-S)
RESET
GND
A5.6V
-30V
DATA2(T-S)
TRACKING
AC5V
To MAIN P.C.B (SYSTEM CONTROL) PG901
PG701
PRESET
DATA(T-TU)
CLOCK(T-TU)
S.CURVE
SYNC DET
FS LOAD
CLOCK(T-V)
DATA(V-T)
To MAIN P.C.B (JACK) PG601
D706~D709 1SS254 x 4
D705 D704 D703 1SS254 x 3
D720 1SS254
VT-M640E ONLY
D725 1SS254
VT-M640E ONLY
D751 SEL2413E OPERATE IND.
D726 1SS254
D710 1SS254
D714 1SS254
D715 1SS254
D728 1SS254
D729 1SS254
D711 1SS254
D712 1SS254
ZD701 HZ9-B3
ZD702 RD2.7E-B2
BZ701 BUZZER
X701 4MHz
X702 32KHz
S711 STOP
S712 PLAY
S713 EJECT
S714 OPERATE
S715 PAUSE
S716 F.FWD
S717 REW
S718 PRESET
S704 PROG+
S705 PROG-
S703 REC/LENGTH
S710 RESET/CLEAR
S709 IRT START
S719 RESET
※ VOLTAGE : STOP MODE
TIMER P.C.B
A
B
C
D
E
1
2
3
4
5
6
7
8

TIMER CIRCUIT BOARD (TIMER)

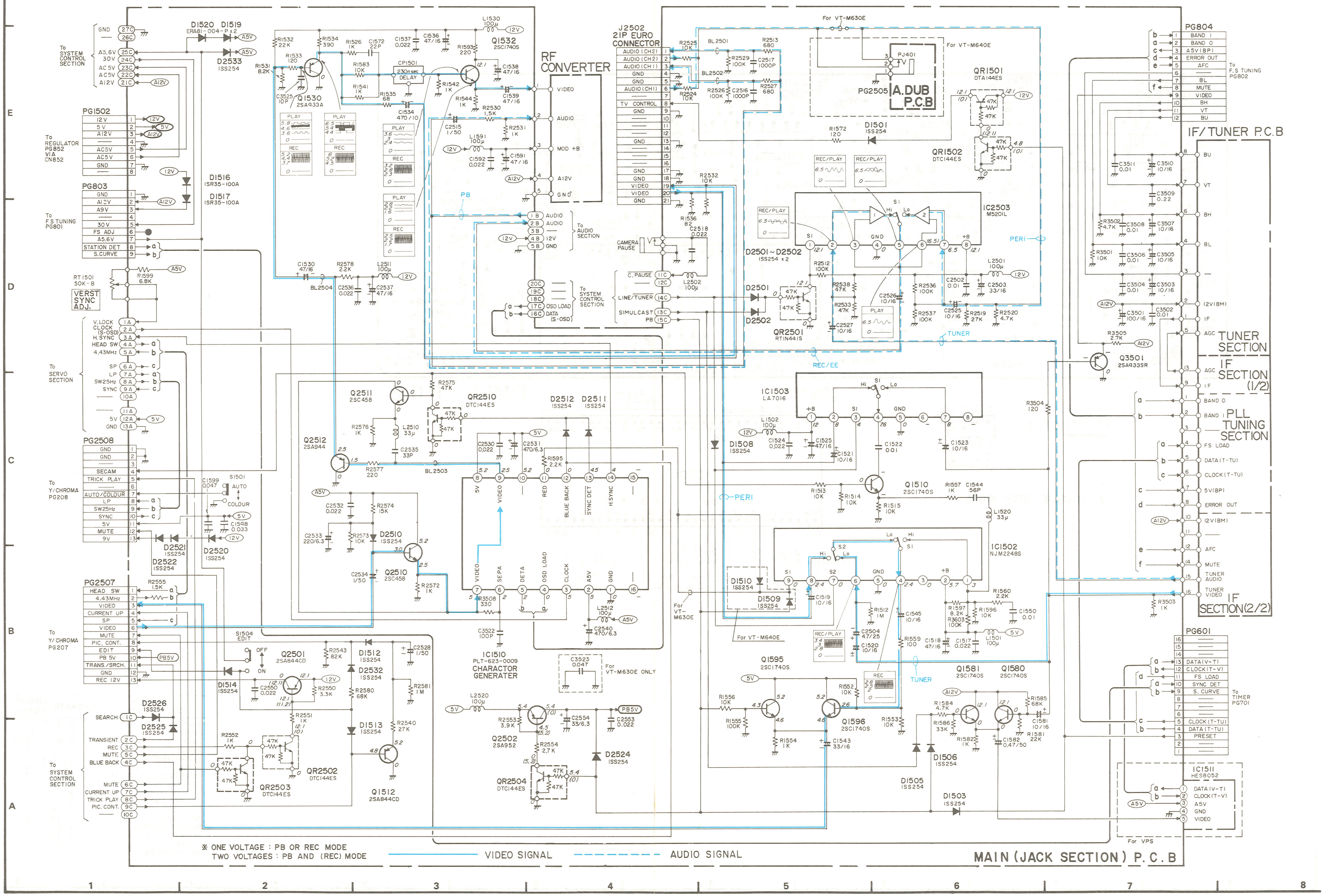

To MAIN
PG601 PG701
To MAIN
PG901 PG702
R737
R731
S710 RESET/CLEAR
S718 PRESET
S717 REW
S716 F.FWD
S715 PAUSE
D710
D712
ZD702
ZD701
D708
D726
D706
R755
R756
R757
S711 STOP
S712 PLAY
VT-M640E ONLY
D720
D725
R729
R726
R730
S705 PROG−
D707
S704 PROG+
D709
D704
D705
D703
S703 REC/LENGTH
S709 IRT START
S719 RESET
R754
DG701
IC703
C715
C701
R741
R727
R728
D711
R740
R736
S713 EJECT
BZ701
IR701
R732
R745
R746
S714 OPERATE
D751
C710
C702
C703
C711
X701
IC702
R744
R720
R721
X702
R723
C709
C708
R722
C705
C704
R719
IC701
R707
R701
R751
R724
R725
R759
D714
C712
D715
D729
R747
D728
TIMER P.C.B


5 5 0
IC703
5 5 5 0
IC702
5 5 5 0
IC701
5 4.6 0 0 0 5 -28 -28
-28 -28 -28 -28
-28
5 0.8 5 5 5 0
0 5 0 5 5 5 5 5 0 0 0 5
-0.2 -0.8 5.2 2.2 1 -0.6

※ VOLTAGE : STOP MODE

DIAGRAM CONFIGURATION	SCHEMATIC	CIRCUIT BOARD
F.S TUNING	5 − 3	/5 − 4
TIMER	5 − 5	/5 − 7
JACK	5 − 9	/5 − 19,23
AUDIO	5 − 11	/5 − 19,23
SLOW DRIVE	5 − 12	/5 − 12
SERVO	5 − 13	/5 − 19,23
SENSOR/MOTOR DRIVE	5 − 15	/5 − 16
CAPSTAN MOTOR DRIVE	5 − 16	/
SYSTEM CONTROL	5 − 17	/5 − 19,23
PRE–REC AMP	5 − 21	/
Y/CHROMA	5 − 25	/5 − 27
REGULATOR	5 − 29	/5 − 29
REMOTE CONTROL	5 − 31	/
IF UNIT	5 − 32	/
TUNER UNIT	5 − 33	/
RF CONVERTER	5 − 35	/

JACK SCHEMATIC DIAGRAM (BUCHSE)

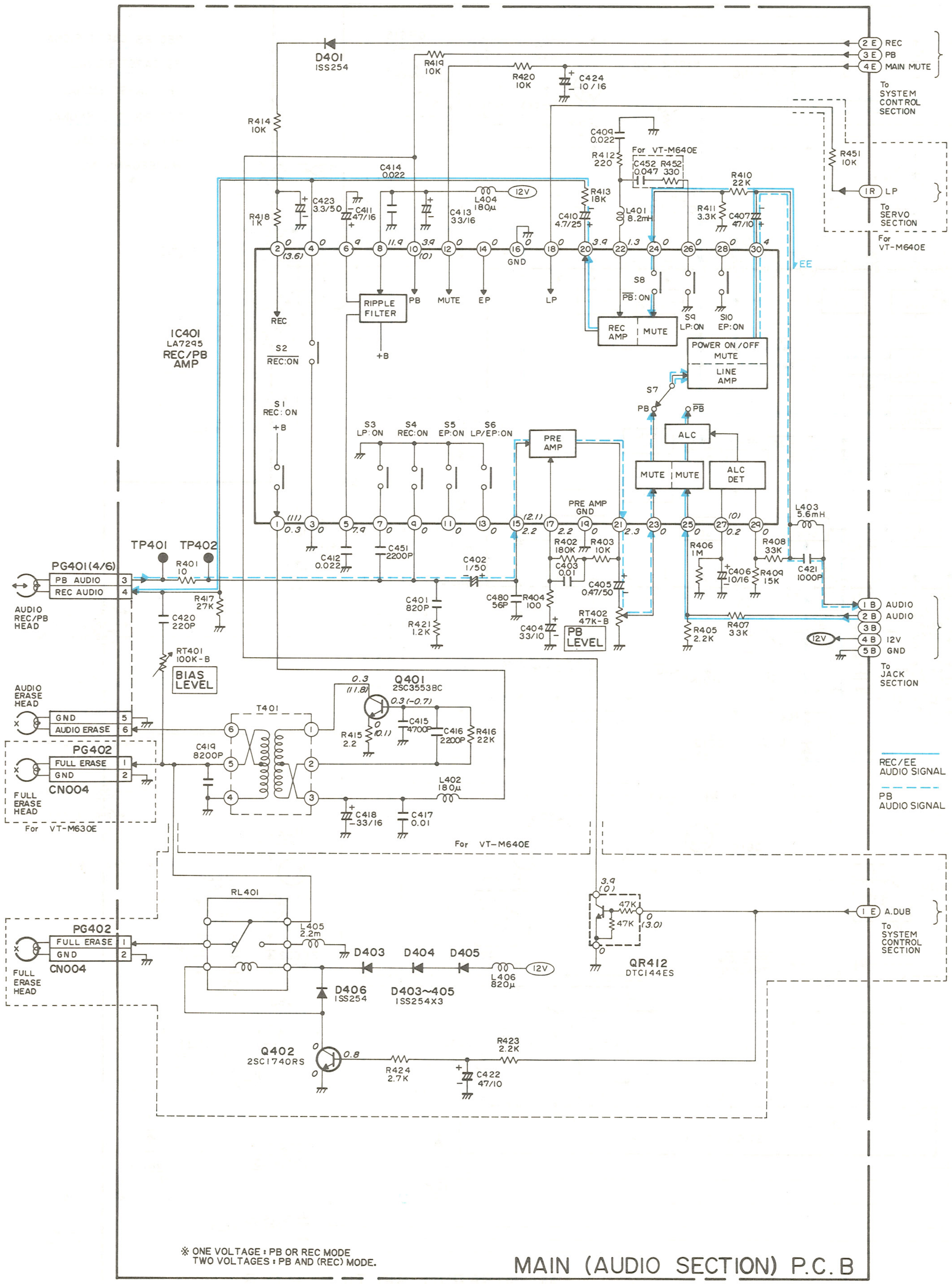


To SYSTEM CONTROL SECTION
PG1502
To REGULATOR PG852 VIA CN852
PG803
To F.S TUNING PG801
RT1501 50K-B
VERST SYNC ADJ.
To SERVO SECTION
PG2508
To Y/CHROMA PG208
PG2507
To Y/CHROMA PG207
To SYSTEM CONTROL SECTION
D1520 D1519 ERA81-004-P x2
D2533 ISS254
D1516 ISR35-100A
D1517 ISR35-100A
Q1530 2SA933A
CP1501 230nsec DELAY
Q1532 2SC1740S
RF CONVERTER
VIDEO
AUDIO
MOD +B
A12V
GND
PB
To AUDIO SECTION
To SYSTEM CONTROL SECTION
OSD LOAD
DATA (S-OSD)
J2502 21P EURO CONNECTOR
AUDIO (CH2)
AUDIO (CH1)
TV CONTROL
VIDEO
CAMERA PAUSE
C. PAUSE
LINE/TUNER
SIMULCAST
For VT-M630E
For VT-M640E
PJ401
PG2505 A.DUB P.C.B
QR1501 DTA144ES
QR1502 DTC144ES
D1501 ISS254
IC2503 M5201L
D2501~D2502 ISS254 x2
QR2501 RTIN441S
PERI
TUNER
REC/EE
IC1503 LA7016
D1508 ISS254
Q1510 2SC1740S
L1520 33μ
IC1502 NJM2248S
D1510 ISS254
D1509 ISS254
Q1595 2SC1740S
Q1596 2SC1740S
Q1581 2SC1740S
Q1580 2SC1740S
D1506 ISS254
D1505 ISS254
D1503 ISS254
Q2511 2SC458
QR2510 DTC144ES
Q2512 2SA944
D2512 D2511 ISS254
Q2510 2SC458
D2510 ISS254
BL2503
BL2504
S1501 AUTO COLOUR
D2521 ISS254
D2522 ISS254
D2520 ISS254
S1504 EDIT
Q2501 2SA844CD
D1512 ISS254
D2532 ISS254
D1514 ISS254
D1513 ISS254
D2526 ISS254
D2525 ISS254
QR2502 DTC144ES
QR2503 DTC144ES
Q1512 2SA844CD
IC1510 PLT-623-0009 CHARACTOR GENERATOR
C3523 0.047 For VT-M630E ONLY
Q2502 2SA952
QR2504 DTC144ES
D2524 ISS254
PG804
To F.S TUNING PG802
QR1501
IF/TUNER P.C.B
TUNER SECTION
IF SECTION (1/2)
PLL TUNING SECTION
IF SECTION (2/2)
Q3501 2SA933SR
PG601
To TIMER PG701
IC1511 HES8052
For VPS
MAIN (JACK SECTION) P.C.B

※ ONE VOLTAGE : PB OR REC MODE
TWO VOLTAGES : PB AND (REC) MODE

VIDEO SIGNAL — AUDIO SIGNAL

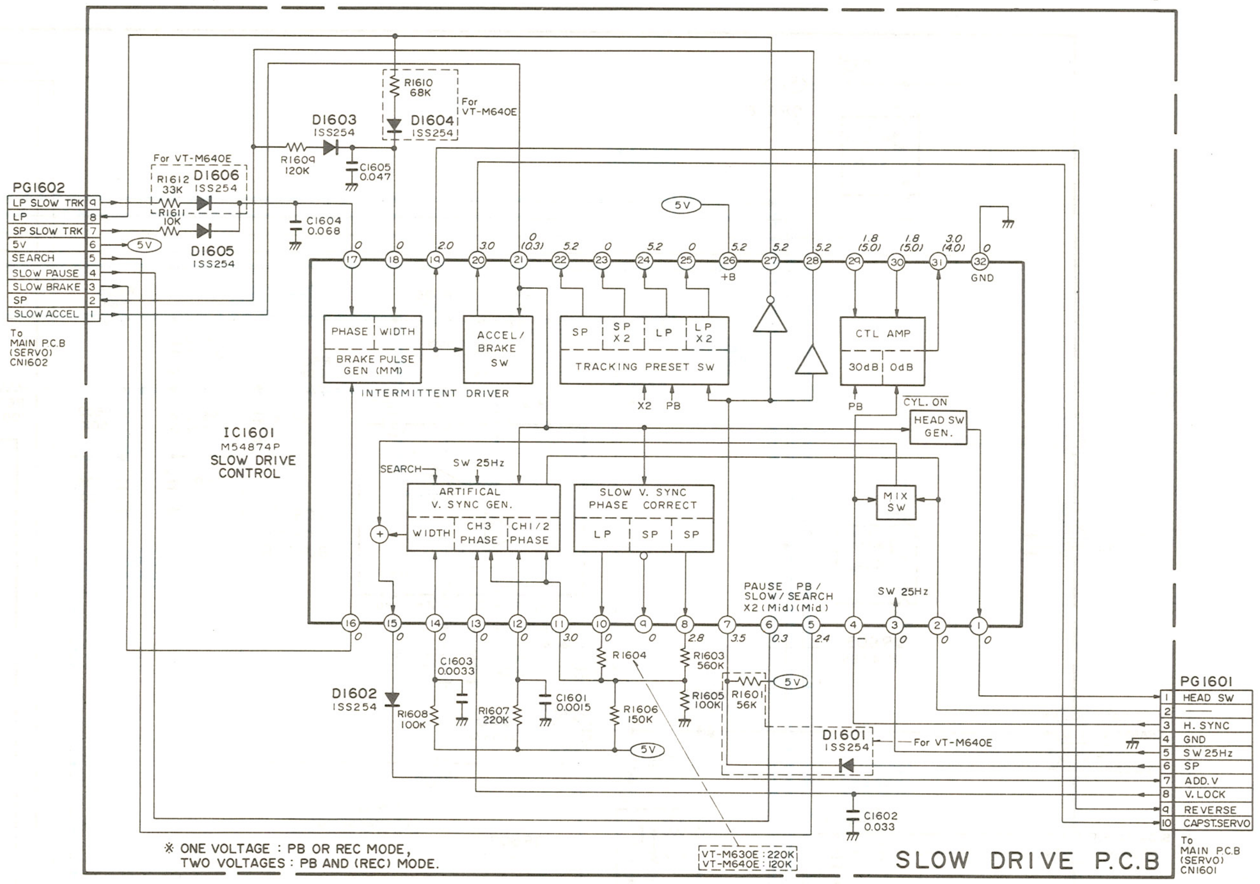
AUDIO SCHEMATIC DIAGRAM (AUDIO)


D401 1SS254
R419 10K
R420 10K
C424 10/16
REC
PB
MAIN MUTE
To SYSTEM CONTROL SECTION
R414 10K
R451 10K
LP
To SERVO SECTION
For VT-M640E
IC401 LA7295 REC/PB AMP
RIPPLE FILTER
REC AMP
MUTE
POWER ON/OFF MUTE
LINE AMP
PRE AMP
ALC
ALC DET
S1 REC:ON
S2 REC:ON
S3 LP:ON
S4 REC:ON
S5 EP:ON
S6 LP/EP:ON
S7
S8 PB:ON
S9 LP:ON
S10 EP:ON
TP401
TP402
PG401(4/6)
PB AUDIO
REC AUDIO
AUDIO REC/PB HEAD
BIAS LEVEL
PB LEVEL
RT401 100K-B
RT402 47K-B
AUDIO
12V
GND
To JACK SECTION
AUDIO ERASE HEAD
GND
AUDIO ERASE
T401
Q401 2SC3553BC
PG402
FULL ERASE
CN004
FULL ERASE HEAD
For VT-M630E
For VT-M640E
RL401
L405 2.2m
D403
D404
D405
L406 820μ
D406 1SS254
D403~405 1SS254X3
Q402 2SC1740RS
R423 2.2K
R424 2.7K
C422 47/10
QR412 DTC144ES
A.DUB
To SYSTEM CONTROL SECTION
REC/EE AUDIO SIGNAL
PB AUDIO SIGNAL
EE

※ ONE VOLTAGE : PB OR REC MODE
TWO VOLTAGES : PB AND (REC) MODE.

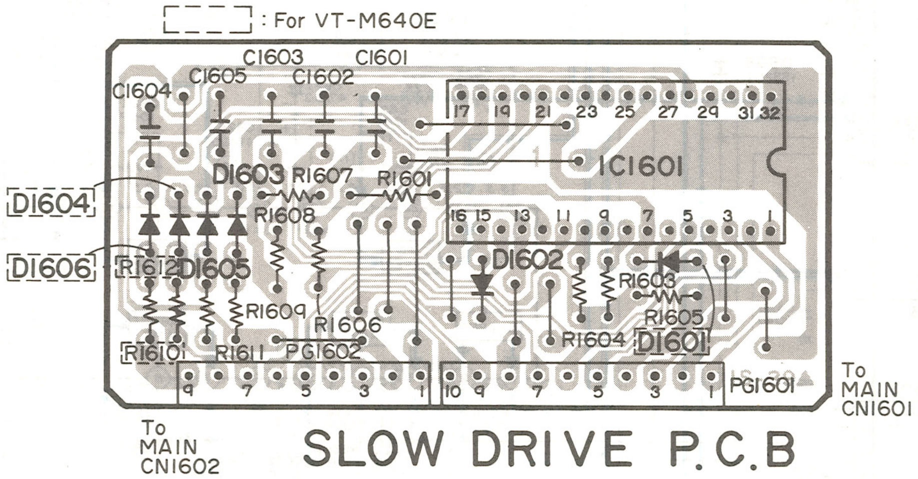
MAIN (AUDIO SECTION) P.C.B

SLOW DRIVE SCHEMATIC DIAGRAM (ZEITLUPEN-TREIBER)

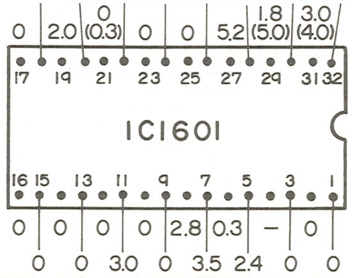

PG1602
LP SLOW TRK
LP
SP SLOW TRK
5V
SEARCH
SLOW PAUSE
SLOW BRAKE
SP
SLOW ACCEL
To MAIN P.C.B (SERVO) CN1602
D1603 1SS254
D1604 1SS254
D1605 1SS254
D1606 1SS254
R1610 68K
For VT-M640E
IC1601 M54874P SLOW DRIVE CONTROL
PHASE WIDTH
BRAKE PULSE GEN (MM)
ACCEL/BRAKE SW
INTERMITTENT DRIVER
TRACKING PRESET SW
CTL AMP
30dB 0dB
CYL. ON
HEAD SW GEN.
ARTIFICAL V. SYNC GEN.
SLOW V. SYNC PHASE CORRECT
MIX SW
PAUSE PB/SLOW/SEARCH
SW 25Hz
D1601 1SS254
D1602 1SS254
PG1601
HEAD SW
H. SYNC
GND
SW 25Hz
SP
ADD.V
V. LOCK
REVERSE
CAPSTSERVO
To MAIN P.C.B (SERVO) CN1601
VT-M630E : 220K
VT-M640E : 120K
SLOW DRIVE P.C.B

※ ONE VOLTAGE : PB OR REC MODE,
TWO VOLTAGES : PB AND (REC) MODE.

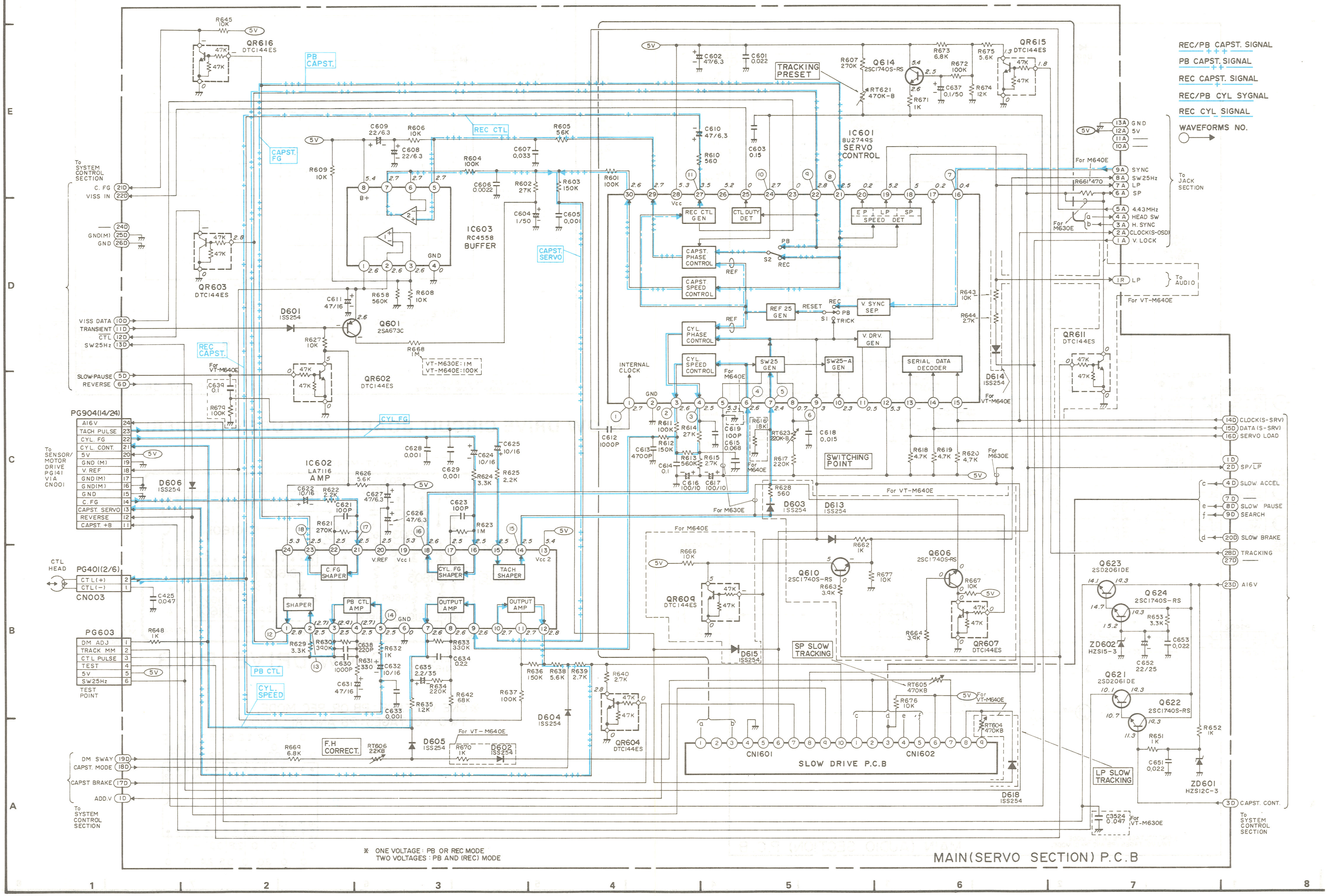
SLOW DRIVE CIRCUIT BOARD (ZEITLUPEN-TREIBER)


[ ] : For VT-M640E
C1603
C1601
C1604
C1605
C1602
IC1601
D1604
D1603
R1607
R1601
R1608
D1606
R1612
D1605
D1602
R1603
R1609
R1605
R1606
R1604
D1601
R1610
R1611
PG1602
PG1601
To MAIN CN1602
To MAIN CN1601
SLOW DRIVE P.C.B

※ONE VOLTAGE : PB OR REC MODE,
TWO VOLTAGES : PB AND (REC) MODE.


IC1601
1.8
0 3.0 5.2 5.2 5.2 5.2 (5.0) 0
0 2.0 (0.3) 0 0 5.2 (5.0) (4.0)
1.8 3.0
17 19 21 23 25 27 29 31 32
16 15 13 11 9 7 5 3 1
0 0 0 0 2.8 0.3 – 0
0 0 3.0 0 3.5 2.4 0 0

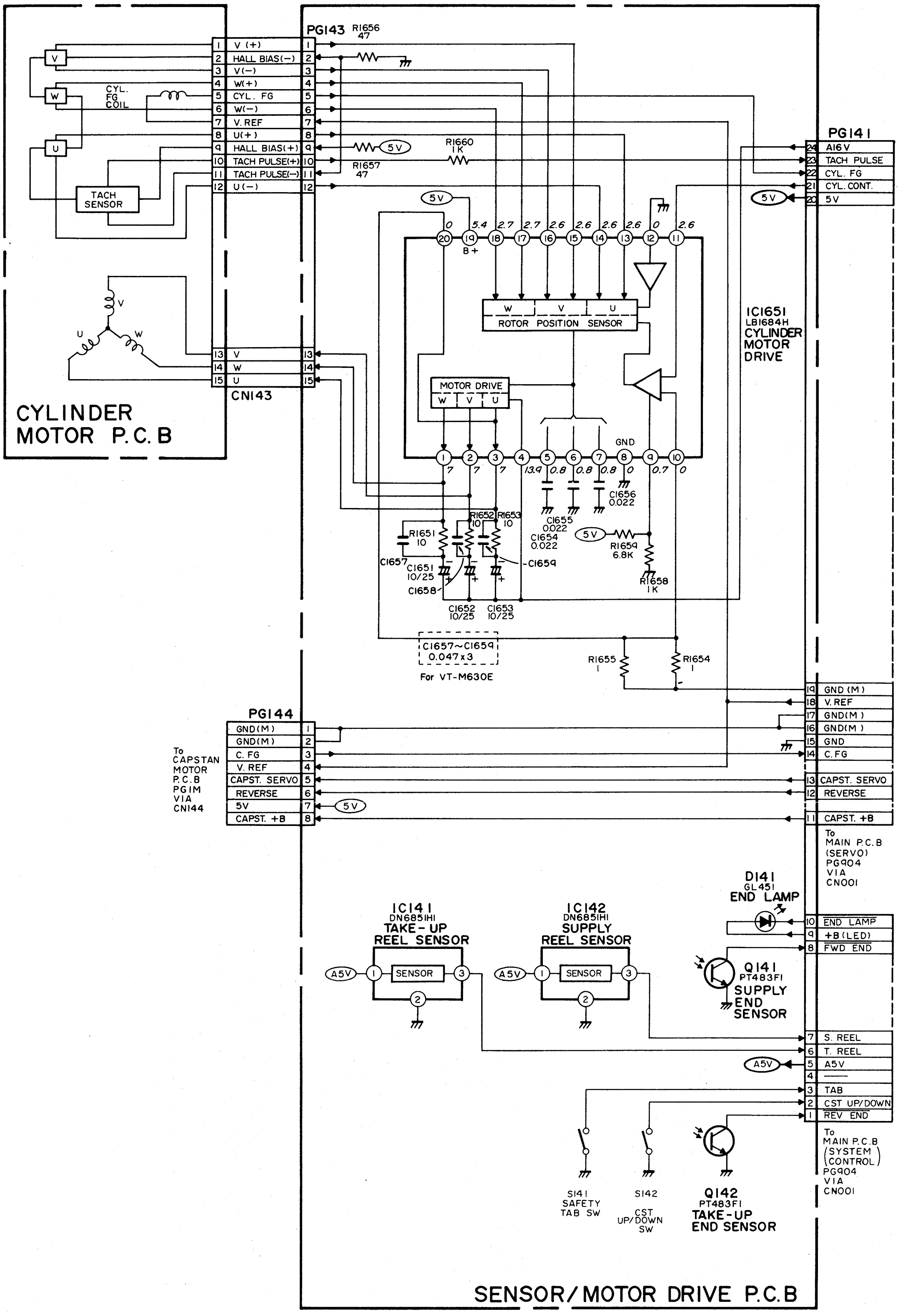
SERVO SCHEMATIC DIAGRAM (SERVO)



IC601
BU2749S
SERVO
CONTROL
IC602
LA7116
AMP
IC603
RC4558
BUFFER
TRACKING
PRESET
REC/PB CAPST. SIGNAL
PB CAPST. SIGNAL
REC CAPST. SIGNAL
REC/PB CYL SYGNAL
REC CYL SIGNAL
WAVEFORMS NO.
PB
CAPST.
CAPST.
FG
REC CTL
CAPST.
SERVO
REC
CAPST.
CYL FG
PB CTL
CYL.
SPEED
REC CTL
GEN
CTL DUTY
DET
EP LP SP
SPEED DET
CAPST.
PHASE
CONTROL
CAPST.
SPEED
CONTROL
REF 25
GEN
V. SYNC
SEP
CYL
PHASE
CONTROL
V. DRV.
GEN
CYL
SPEED
CONTROL
SW25
GEN
SW25-A
GEN
SERIAL DATA
DECODER
INTERNAL
CLOCK
SWITCHING
POINT
C.FG
SHAPER
CYL.FG
SHAPER
TACH
SHAPER
SHAPER
PB CTL
AMP
OUTPUT
AMP
OUTPUT
AMP
F.H
CORRECT.
SP SLOW
TRACKING
LP SLOW
TRACKING
SLOW DRIVE P.C.B
CN1601
CN1602
To
SYSTEM
CONTROL
SECTION
C. FG
VISS IN
GND(M)
GND
VISS DATA
TRANSIENT
CTL
SW25Hz
SLOW·PAUSE
REVERSE
PG904(14/24)
A16V
TACH PULSE
CYL. FG
CYL. CONT.
5V
GND (M)
V. REF
GND (M)
GND(M)
GND
C. FG
CAPST. SERVO
REVERSE
CAPST. +B
To
SENSOR/
MOTOR
DRIVE
PG141
VIA
CN001
CTL
HEAD
PG401(2/6)
CTL(+)
CTL(-)
CN003
PG603
DM ADJ
TRACK MM
CTL PULSE
TEST
5V
SW25Hz
TEST
POINT
DM SWAY
CAPST. MODE
CAPST BRAKE
ADD.V
To
SYSTEM
CONTROL
SECTION
GND
5V
SYNC
SW25Hz
LP
SP
4.43MHz
HEAD SW
H. SYNC
CLOCK(S-OSD)
V. LOCK
To
JACK
SECTION
LP
To
AUDIO
For VT-M640E
CLOCK(S-SRV)
DATA(S-SRV)
SERVO LOAD
SP/LP
SLOW ACCEL
SLOW PAUSE
SEARCH
SLOW BRAKE
TRACKING
A16V
CAPST. CONT.
To
SYSTEM
CONTROL
SECTION
QR616
DTC144ES
QR603
DTC144ES
QR602
DTC144ES
Q601
2SA673C
Q614
2SC1740S-RS
QR615
DTC144ES
QR611
DTC144ES
Q606
2SC1740S-RS
Q610
2SC1740S-RS
QR609
DTC144ES
QR607
DTC144ES
QR604
DTC144ES
Q623
2SD2061DE
Q624
2SC1740S-RS
Q621
2SD2061DE
Q622
2SC1740S-RS
ZD602
HZS15-3
ZD601
HZS12C-3
D601
1SS254
D606
1SS254
D603
1SS254
D613
1SS254
D614
1SS254
D615
1SS254
D604
1SS254
D605
1SS254
D602
1SS254
D618
1SS254
VT-M630E : 1M
VT-M640E : 100K
For M640E
For M630E
For VT-M630E
MAIN(SERVO SECTION) P.C.B

※ ONE VOLTAGE : PB OR REC MODE
TWO VOLTAGES : PB AND (REC) MODE

SENSOR/MOTOR DRIVE (SENSOR/MOTORTREIBER) SCHEMATIC DIAGRAM


CYLINDER MOTOR P.C.B
CYL. FG COIL
TACH SENSOR
CN143
PG143
1 V (+)
2 HALL BIAS(−)
3 V(−)
4 W(+)
5 CYL. FG
6 W(−)
7 V. REF
8 U(+)
9 HALL BIAS(+)
10 TACH PULSE(+)
11 TACH PULSE(−)
12 U(−)
13 V
14 W
15 U
R1656 47
R1657 47
R1660 1K
5V
PG141
24 A16V
23 TACH PULSE
22 CYL. FG
21 CYL. CONT.
20 5V
IC1651 LB1684H CYLINDER MOTOR DRIVE
ROTOR POSITION SENSOR
MOTOR DRIVE
B+
GND
R1651 10
R1652 10
R1653 10
C1651 10/25
C1652 10/25
C1653 10/25
C1654 0.022
C1655 0.022
C1656 0.022
C1657
C1658
C1659
R1658 1K
R1659 6.8K
C1657~C1659 0.047x3
For VT-M630E
R1655 1
R1654 1
PG144
1 GND(M)
2 GND(M)
3 C. FG
4 V. REF
5 CAPST. SERVO
6 REVERSE
7 5V
8 CAPST. +B
To CAPSTAN MOTOR P.C.B PG1M VIA CN144
19 GND (M)
18 V. REF
17 GND(M)
16 GND(M)
15 GND
14 C.FG
13 CAPST. SERVO
12 REVERSE
11 CAPST. +B
To MAIN P.C.B (SERVO) PG904 VIA CN001
D141 GL451 END LAMP
10 END LAMP
9 +B (LED)
8 FWD END
Q141 PT483F1 SUPPLY END SENSOR
IC141 DN6851H1 TAKE-UP REEL SENSOR
IC142 DN6851H1 SUPPLY REEL SENSOR
SENSOR
A5V
7 S. REEL
6 T. REEL
5 A5V
4 ——
3 TAB
2 CST UP/DOWN
1 REV END
To MAIN P.C.B (SYSTEM CONTROL) PG904 VIA CN001
S141 SAFETY TAB SW
S142 CST UP/DOWN SW
Q142 PT483F1 TAKE-UP END SENSOR
SENSOR/MOTOR DRIVE P.C.B

CAPSTAN MOTOR DRIVE SCHEMATIC DIAGRAM (CAPSTANMOTORTREIBER)

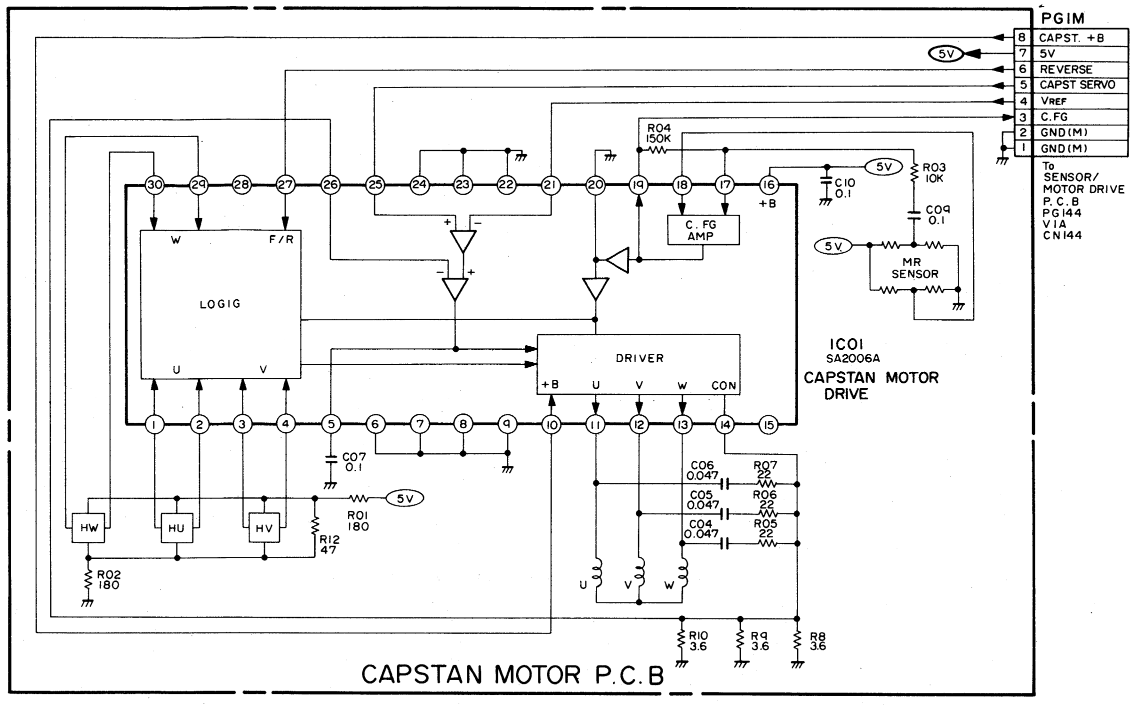

PG1M
8 CAPST. +B
7 5V
6 REVERSE
5 CAPST SERVO
4 VREF
3 C.FG
2 GND(M)
1 GND(M)
To SENSOR/MOTOR DRIVE P.C.B PG144 VIA CN144
LOGIG
W
F/R
U
V
DRIVER
+B
CON
C. FG AMP
MR SENSOR
IC01 SA2006A CAPSTAN MOTOR DRIVE
R04 150K
R03 10K
C10 0.1
C09 0.1
C07 0.1
R01 180
R12 47
R02 180
HW
HU
HV
C06 0.047
C05 0.047
C04 0.047
R07 22
R06 22
R05 22
R10 3.6
R9 3.6
R8 3.6
5V
CAPSTAN MOTOR P.C.B

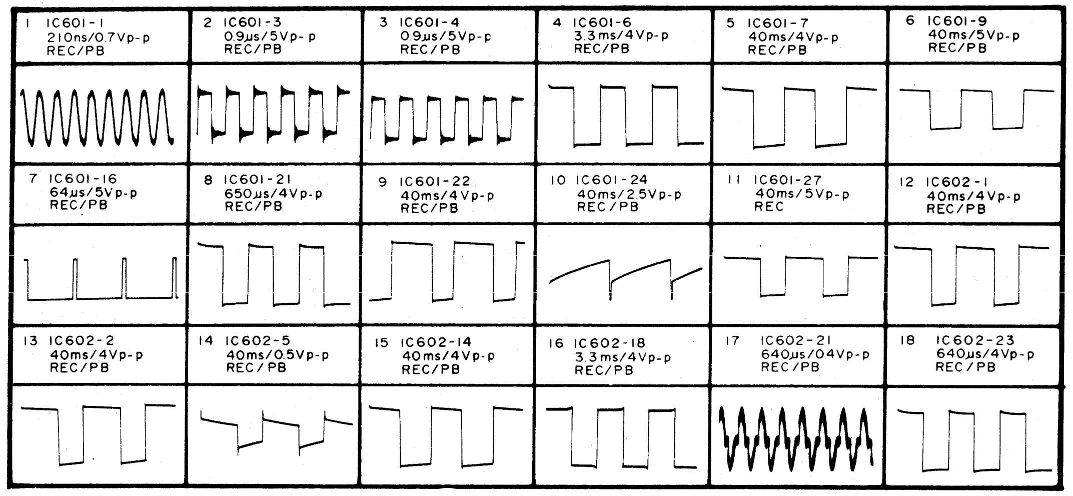
DIAGRAM CONFIGURATION	SCHEMATIC	CIRCUIT BOARD
F.S TUNING	5-3	5-4
TIMER	5-5	5-7
JACK	5-9	5-19,23
AUDIO	5-11	5-19,23
SLOW DRIVE	5-12	5-12
SERVO	5-13	5-19,23
SENSOR/MOTOR DRIVE	5-15	5-16
CAPSTAN MOTOR DRIVE	5-16	
SYSTEM CONTROL	5-17	5-19,23
PRE-REC AMP	5-21	
Y/CHROMA	5-25	5-27
REGULATOR	5-29	5-29
REMOTE CONTROL	5-31	
IF UNIT	5-32	
TUNER UNIT	5-33	
RF CONVERTER	5-35	

WAVEFORM MEASUREMENT CONDITION

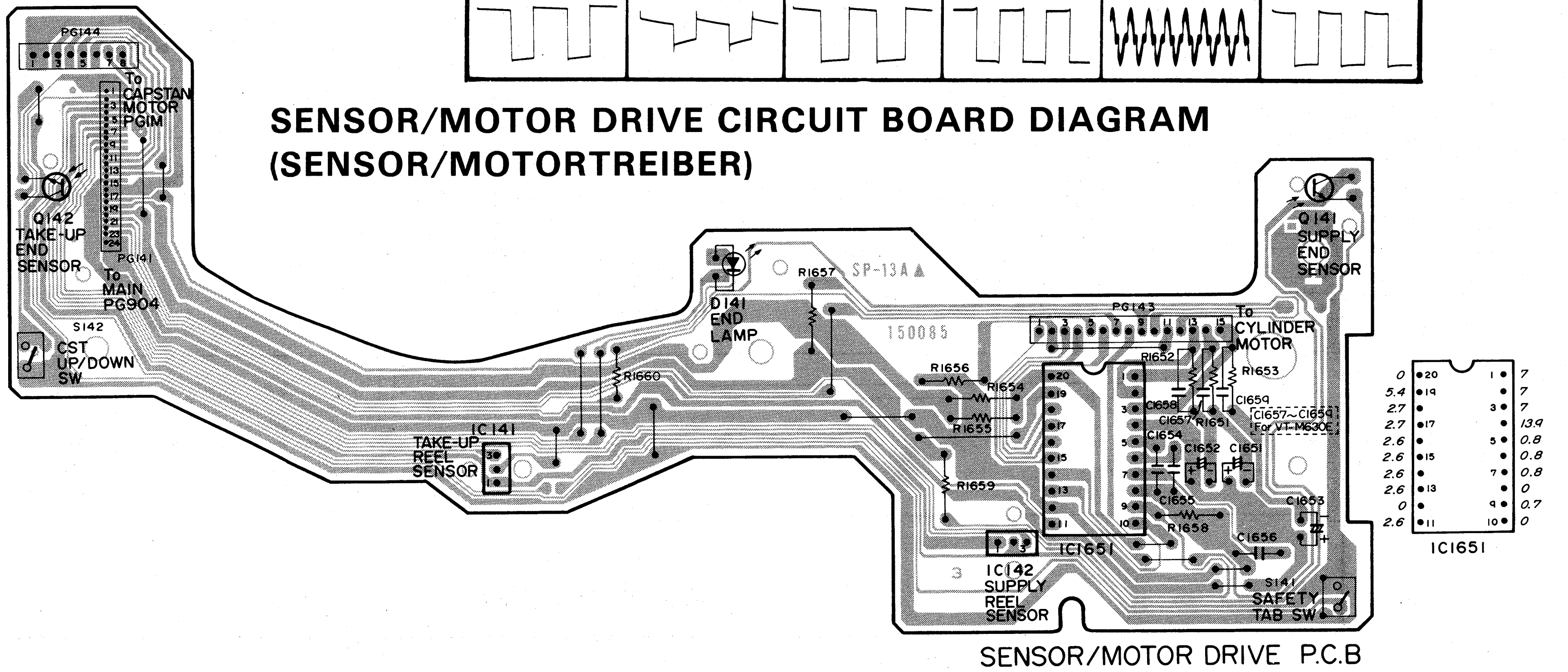
REC : Apply 1Vp-p colour bar signal.

PB : Play colour bar signal of PAL alignment tape.

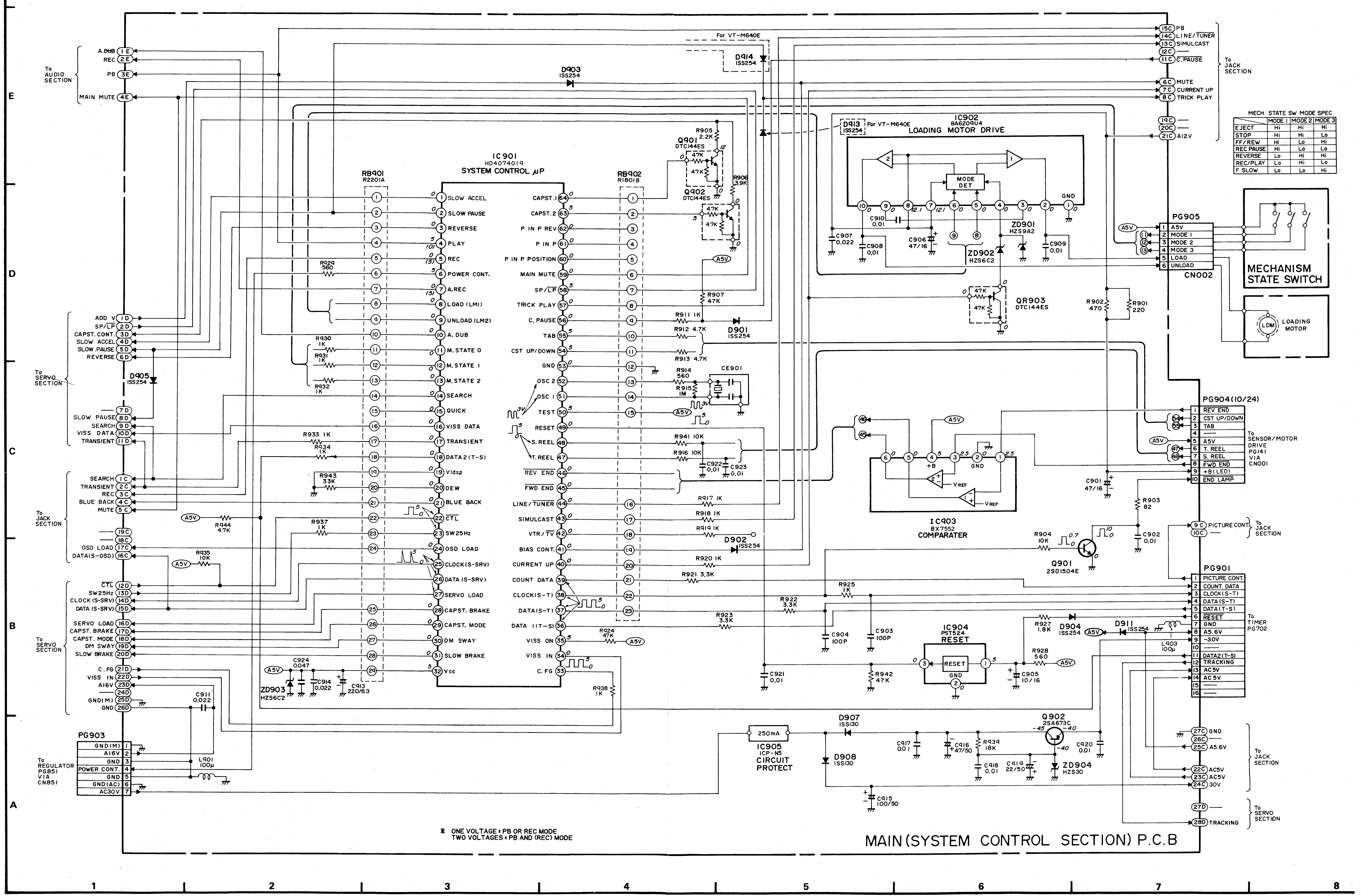
SERVO WAVEFORMS (SERVO-WELLENFORMEN)



SENSOR/MOTOR DRIVE CIRCUIT BOARD DIAGRAM (SENSOR/MOTORTREIBER)


PG144
To CAPSTAN MOTOR PG1M
Q142 TAKE-UP END SENSOR
PG141
To MAIN PG904
S142 CST UP/DOWN SW
IC141 TAKE-UP REEL SENSOR
R1660
D141 END LAMP
R1657
SP-13A ▲
150085
R1656
R1654
R1655
R1659
PG143
To CYLINDER MOTOR
R1652
R1653
C1658
C1657
R1651
C1659
C1657~C1659 For VT-M630E
C1654
C1652
C1651
C1655
C1653
R1658
C1656
IC1651
IC142 SUPPLY REEL SENSOR
S141 SAFETY TAB SW
Q141 SUPPLY END SENSOR
SENSOR/MOTOR DRIVE P.C.B
0 5.4 2.7 2.7 2.6 2.6 2.6 2.6 0 2.6
7 7 7 13.9 0.8 0.8 0.8 0 0.7 0
IC1651

SYSTEM CONTROL SCHEMATIC DIAGRAM (SYSTEMREGELUNG)


IC901
HD4074019
SYSTEM CONTROL µP
RB901
R2201A
RB902
R1801B
SLOW ACCEL
SLOW PAUSE
REVERSE
PLAY
REC
POWER CONT.
A.REC
LOAD (LM1)
UNLOAD (LM2)
A. DUB
M. STATE 0
M. STATE 1
M. STATE 2
SEARCH
QUICK
VISS DATA
TRANSIENT
DATA 2 (T-S)
Vldsp
DEW
BLUE BACK
CTL
SW25Hz
OSD LOAD
CLOCK(S-SRV)
DATA (S-SRV)
SERVO LOAD
CAPST. BRAKE
CAPST. MODE
DM SWAY
SLOW BRAKE
Vcc
CAPST. 1
CAPST. 2
P IN P REV
P IN P
P IN P POSITION
MAIN MUTE
SP/LP
TRICK PLAY
C. PAUSE
TAB
CST UP/DOWN
GND
OSC 2
OSC 1
TEST
RESET
S. REEL
T. REEL
REV END
FWD END
LINE/TUNER
SIMULCAST
VTR/TV
BIAS CONT.
CURRENT UP
COUNT DATA
CLOCK(S-T)
DATA(S-T)
DATA I(T-S)
VISS ON
VISS IN
C. FG
To AUDIO SECTION
A.DUB 1E
REC 2E
PB 3E
MAIN MUTE 4E
To SERVO SECTION
ADD V 1D
SP/LP 2D
CAPST. CONT. 3D
SLOW ACCEL 4D
SLOW PAUSE 5D
REVERSE 6D
7D
SLOW PAUSE 8D
SEARCH 9D
VISS DATA 10D
TRANSIENT 11D
D905 ISS254
To JACK SECTION
SEARCH 1C
TRANSIENT 2C
REC 3C
BLUE BACK 4C
MUTE 5C
19C
18C
OSD LOAD 17C
DATA(S-OSD) 16C
CTL 12D
SW25Hz 13D
CLOCK (S-SRV) 14D
DATA (S-SRV) 15D
SERVO LOAD 16D
CAPST. BRAKE 17D
CAPST. MODE 18D
DM SWAY 19D
SLOW BRAKE 20D
C. FG 21D
VISS IN 22D
A16V 23D
24D
GND(M) 25D
GND 26D
PG903
GND(M) 1
A16V 2
GND 3
POWER CONT. 4
GND 5
GND(AC) 6
AC30V 7
To REGULATOR PG851 VIA CN851
L901 100µ
C911 0.022
R929 560
R930 1K
R931 1K
R932 1K
R933 1K
R934 1K
R943 33K
R937 1K
R944 4.7K
R935 10K
A5V
C924 0.047
C914 0.022
C913 220/6.3
ZD903 HZS6C2
D903 ISS254
For VT-M640E
D914 ISS254
D913 ISS254 For VT-M640E
R905 2.2K
Q901 DTC144ES
47K
R906 3.9K
Q902 DTC144ES
R907 47K
R911 1K
R912 4.7K
R913 4.7K
D901 ISS254
R914 560
R915 1M
CE901
R941 10K
R916 10K
C922 0.01
C923 0.01
R917 1K
R918 1K
R919 1K
D902 ISS254
R920 1K
R921 3.3K
R922 3.3K
R923 3.3K
R924 47K
R938 1K
R925 1K
C904 100P
C903 100P
C921 0.01
IC902
BA6209U4
LOADING MOTOR DRIVE
MODE DET
GND
C910 0.01
C906 47/16
C907 0.022
C908 0.01
ZD901 HZS9A2
ZD902 HZS6C2
C909 0.01
QR903 DTC144ES
R902 470
R901 220
IC903
BX7552
COMPARATER
+B
GND
VREF
C901 47/16
R903 82
C902 0.01
R904 10K
Q901 2SD1504E
IC904
PST524
RESET
R942 47K
R927 1.8K
D904 ISS254
D911 ISS254
L903 100µ
R928 560
C905 10/16
250mA
IC905
ICP-N5
CIRCUIT PROTECT
D907 ISS130
D908 ISS130
C917 0.01
C916 47/50
R939 18K
C918 0.01
C919 22/50
Q902 2SA673C
C920 0.01
ZD904 HZS30
C915 100/50
PB 15C
LINE/TUNER 14C
SIMULCAST 13C
12C
C.PAUSE 11C
MUTE 6C
CURRENT UP 7C
TRICK PLAY 8C
19C
20C
A12V 21C
To JACK SECTION
PG905
A5V 1
MODE 1 2
MODE 2 3
MODE 3 4
LOAD 5
UNLOAD 6
CN002
MECHANISM STATE SWITCH
LDM
LOADING MOTOR
PG904(10/24)
REV END 1
CST UP/DOWN 2
TAB 3
4
A5V 5
T. REEL 6
S. REEL 7
FWD END 8
+B(LED) 9
END LAMP 10
To SENSOR/MOTOR DRIVE PG141 VIA CN001
PICTURE CONT. 9C
10C
To JACK SECTION
PG901
PICTURE CONT. 1
COUNT. DATA 2
CLOCK(S-T) 3
DATA(S-T) 4
DATA(T-S) 5
RESET 6
GND 7
A5.6V 8
-30V 9
10
DATA2(T-S) 11
TRACKING 12
AC5V 13
AC5V 14
15
16
To TIMER PG702
GND 27C
26C
A5.6V 25C
AC5V 22C
AC5V 23C
30V 24C
To JACK SECTION
27D
TRACKING 28D
To SERVO SECTION
E
D
C
B
A
1
2
3
4
5
6
7
8

MECH STATE SW MODE SPEC

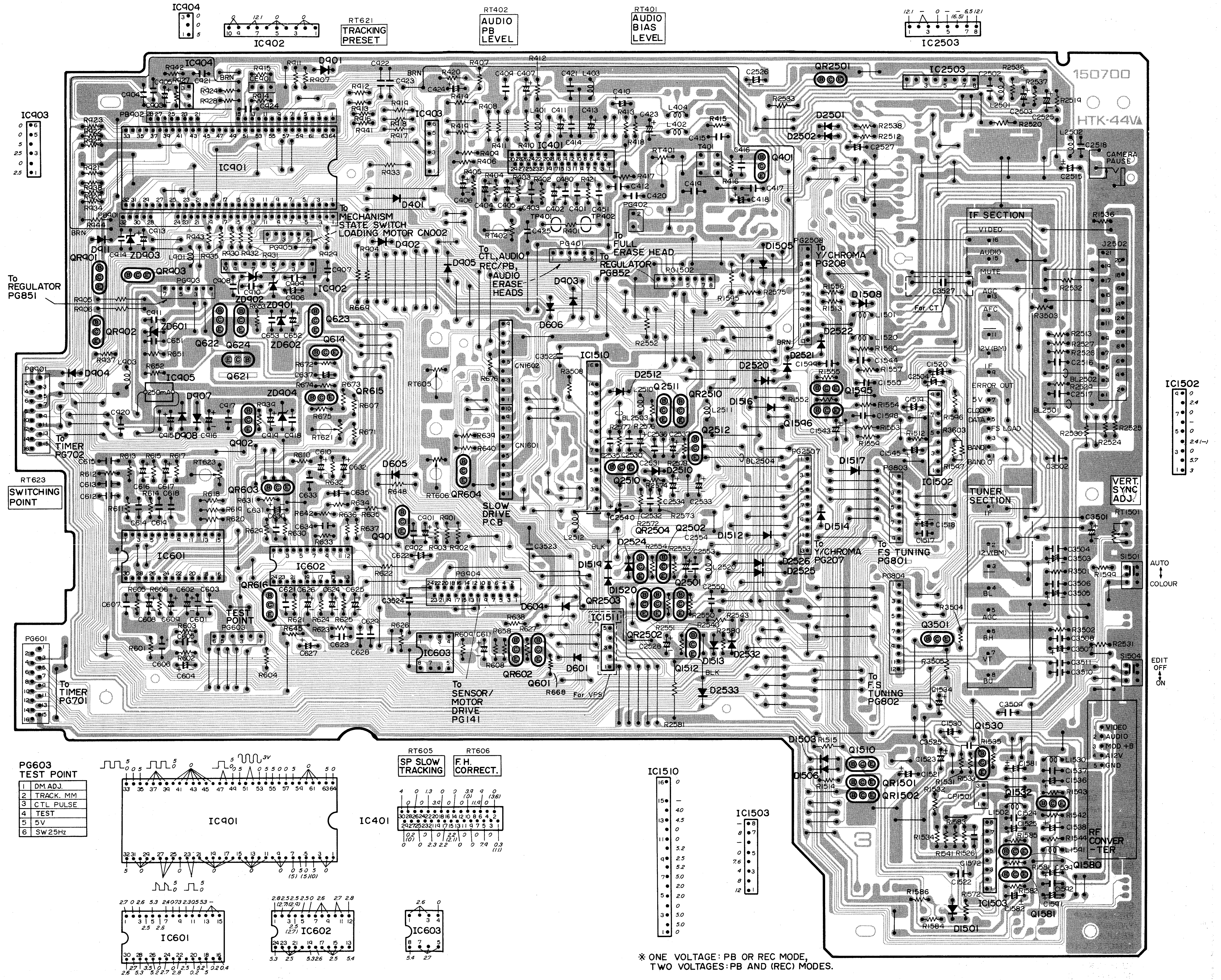
	MODE 1	MODE 2	MODE 3
EJECT	Hi	Hi	Hi
STOP	Hi	Hi	Lo
FF/REW	Hi	Lo	Hi
REC PAUSE	Hi	Lo	Lo
REVERSE	Lo	Hi	Hi
REC/PLAY	Lo	Hi	Lo
F SLOW	Lo	Lo	Hi

※ ONE VOLTAGE : PB OR REC MODE
TWO VOLTAGES : PB AND (REC) MODE

MAIN (SYSTEM CONTROL SECTION) P.C.B

MAIN CIRCUIT BOARD DIAGRAM -VT-M630E-
(HAUPT)

DIAGRAM CONFIGURATION	SCHEMATIC	CIRCUIT BOARD
F.S TUNING	5-3	/5-4
TIMER	5-5	/5-7
JACK	5-9	/5-19,23
AUDIO	5-11	/5-19,23
SLOW DRIVE	5-12	/5-12
SERVO	5-13	/5-19,23
SENSOR/MOTOR DRIVE	5-15	/5-16
CAPSTAN MOTOR DRIVE	5-16	/
SYSTEM CONTROL	5-17	/5-19,23
PRE-REC AMP	5-21	/
Y/CHROMA	5-25	/5-27
REGULATOR	5-29	/5-29
REMOTE CONTROL	5-31	/
IF UNIT	5-32	/
TUNER UNIT	5-33	/
RF CONVERTER	5-35	/


IC904
IC902
RT621 TRACKING PRESET
RT402 AUDIO PB LEVEL
RT401 AUDIO BIAS LEVEL
IC2503
IC903
150700
HTK-44V
CAMERA PAUSE
IC901
IC401
IC1510
IC1502
IC601
IC602
IC603
IC1511
IC1503
To MECHANISM STATE SWITCH LOADING MOTOR CN002
To CTL, AUDIO REC/PB, AUDIO ERASE HEADS
To FULL ERASE HEAD
To REGULATOR PG852
To REGULATOR PG851
To Y/CHROMA PG208
To Y/CHROMA PG207
To F.S TUNING PG801
To F.S TUNING PG802
To TIMER PG702
To TIMER PG701
To SENSOR/ MOTOR DRIVE PG141
SLOW DRIVE P.C.B
RT623 SWITCHING POINT
TEST POINT PG603
IF SECTION
TUNER SECTION
VERT. SYNC ADJ.
AUTO COLOUR
EDIT OFF ON
RF CONVER -TER
VIDEO
AUDIO
MOD.+B
12V
GND
RT605 SP SLOW TRACKING
RT606 F.H. CORRECT.
For VPS
For CT
E
D
C
B
A
1
2
3
4
5
6
7
8

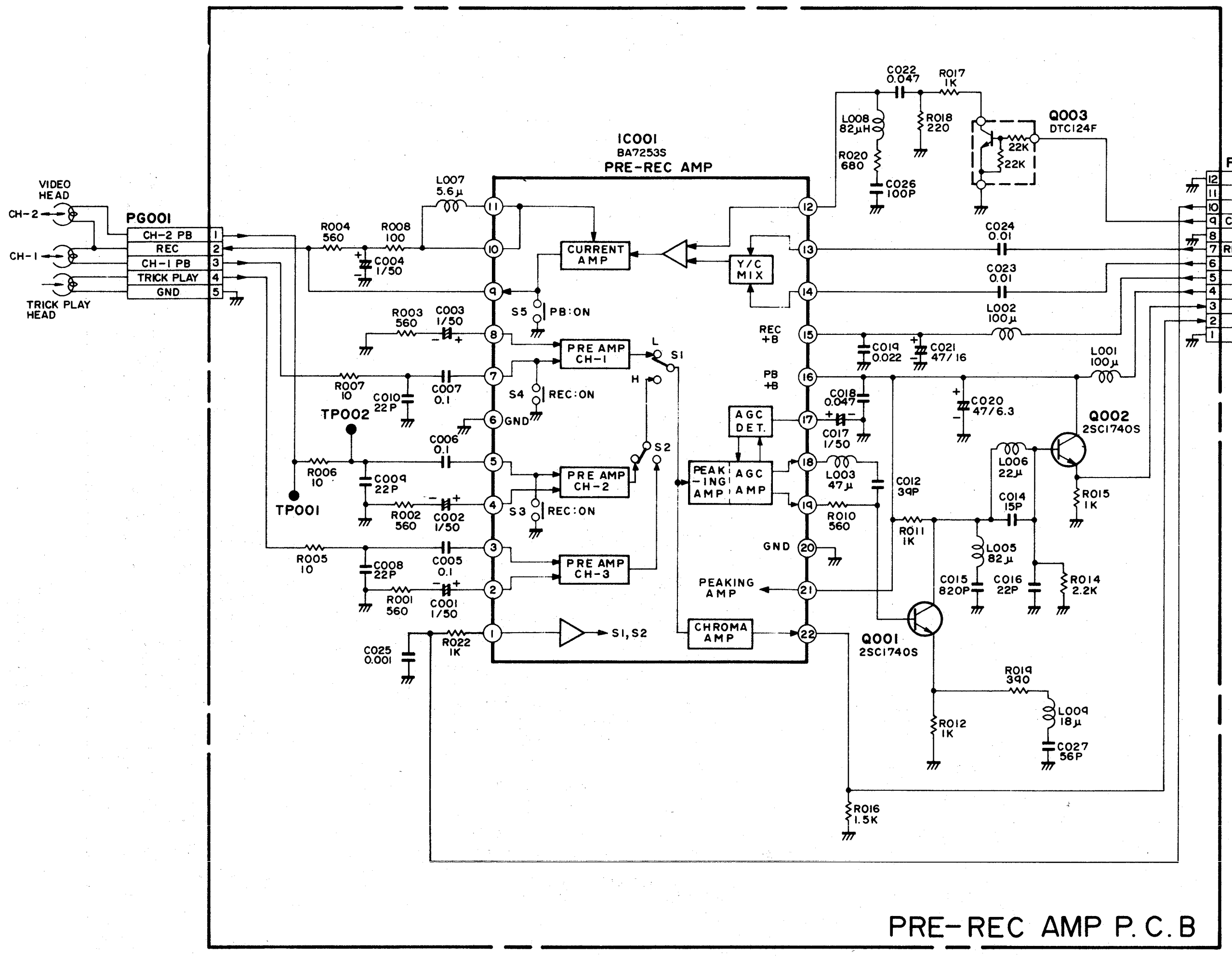
PG603
TEST POINT

1	DM. ADJ.
2	TRACK. MM
3	CTL PULSE
4	TEST
5	5V
6	SW 25Hz

※ ONE VOLTAGE: PB OR REC MODE,
TWO VOLTAGES: PB AND (REC) MODES.

MAIN (SERVO/SYSTEM CONTROL/JACK) P.C.B

PRE-REC AMP SCHEMATIC DIAGRAM –VT-M630E–
(AUFNAHME-VORVOERSTARKER)


VIDEO HEAD
CH-2
CH-1
TRICK PLAY HEAD
PG001
CH-2 PB
REC
CH-1 PB
TRICK PLAY
GND
IC001 BA7253S PRE-REC AMP
CURRENT AMP
Y/C MIX
PRE AMP CH-1
PRE AMP CH-2
PRE AMP CH-3
AGC DET
PEAK-ING AMP
AGC AMP
CHROMA AMP
PEAKING AMP
S1,S2
S5 PB:ON
S4 REC:ON
S3 REC:ON
Q001 2SC1740S
Q002 2SC1740S
Q003 DTC124F
TP001
TP002
PG002
GND
HEAD SW
CURRENT UP
GND
REC CHROMA
REC FM
REC 12V
PB 5V
PB FM(Y)
PB FM(C)
GND
To Y/CHROMA PG201 VIA CN006
PRE-REC AMP P.C.B

PRE-REC AMP SCHEMATIC DIAGRAM –VT-M640E–
(AUFNAHME-VORVOERSTARKER)

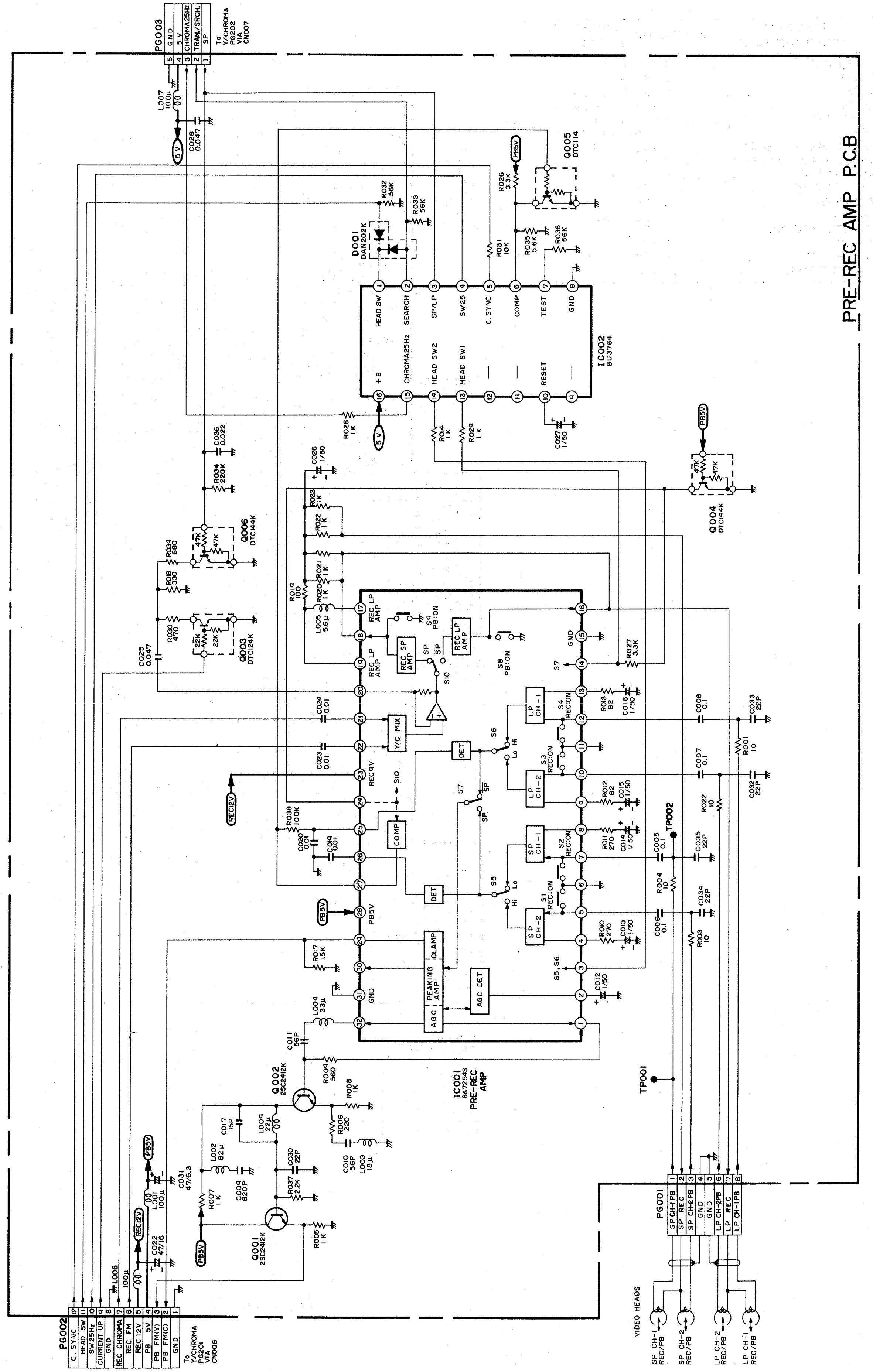
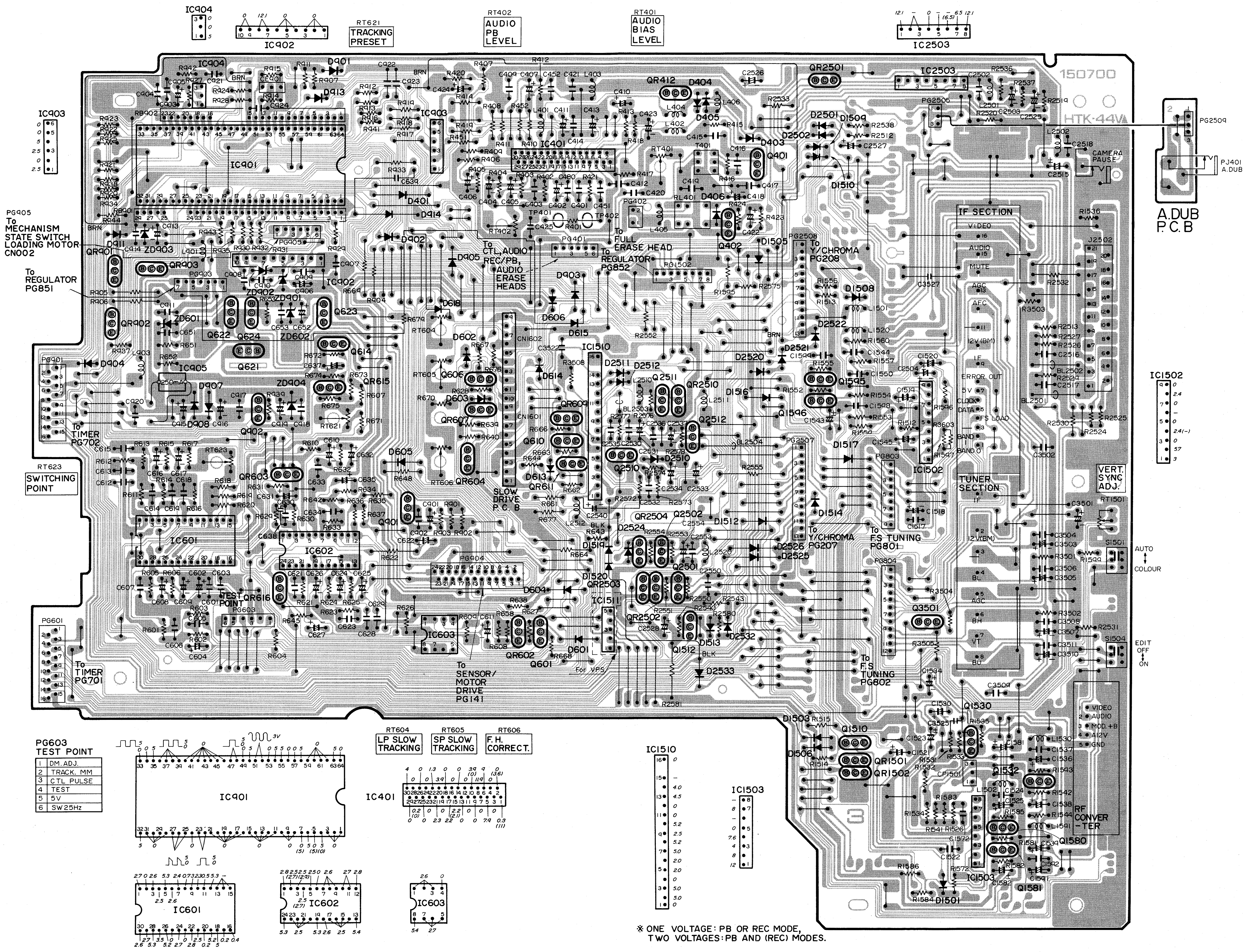

PRE-REC AMP P.C.B
PG003
To Y/CHROMA PG202 VIA CN007
IC002 BU3764
IC001 BA7265S PRE-REC AMP
D001 DAN202K
Q001 2SC2412K
Q002 2SC2412K
Q003 DTC124K
Q004 DTC144K
Q005 DTC114
Q006 DTC144K
TP001
TP002
PG001
SP CH-1 PB
SP REC
SP CH-2 PB
GND
GND
LP CH-2 PB
LP REC
LP CH-1 PB
VIDEO HEADS
SP CH-1 REC/PB
SP CH-2 REC/PB
LP CH-2 REC/PB
LP CH-1 REC/PB
PG002
C.SYNC
HEAD SW
SW 25Hz
CURRENT UP
GND
REC CHROMA
REC FM
REC 12V
PB 5V
PB FM(Y)
PB FM(C)
GND
To Y/CHROMA PG201 VIA CN006

DIAGRAM CONFIGURATION	SCHEMATIC	CIRCUIT BOARD
F.S TUNING	5-3	/5-4
TIMER	5-5	/5-7
JACK	5-9	/5-19,23
AUDIO	5-11	/5-19,23
SLOW DRIVE	5-12	/5-12
SERVO	5-13	/5-19,23
SENSOR/MOTOR DRIVE	5-15	/5-16
CAPSTAN MOTOR DRIVE	5-16	/
SYSTEM CONTROL	5-17	/5-19,23
PRE-REC AMP	5-21	/
Y/CHROMA	5-25	/5-27
REGULATOR	5-29	/5-29
REMOTE CONTROL	5-31	/
IF UNIT	5-32	/
TUNER UNIT	5-33	/
RF CONVERTER	5-35	/

MAIN CIRCUIT BOARD DIAGRAM -VT-M640E- (HAUPT)


IC904
IC902
RT621 TRACKING PRESET
RT402 AUDIO PB LEVEL
RT401 AUDIO BIAS LEVEL
IC2503
150700
HTK-44V
IC903
PG905 To MECHANISM STATE SWITCH LOADING MOTOR CN002
To REGULATOR PG851
To CTL,AUDIO REC/PB, AUDIO ERASE HEADS
To FULL ERASE HEAD
To REGULATOR PG852
To Y/CHROMA PG208
IF SECTION
CAMERA PAUSE
PG2509
PJ401 A.DUB
A.DUB P.C.B
IC1502
PG901
To TIMER PG702
RT623 SWITCHING POINT
SLOW DRIVE P.C.B
TUNER SECTION
VERT. SYNC ADJ.
AUTO COLOUR
To Y/CHROMA PG207
To F.S TUNING PG801
EDIT OFF ON
TEST POINT
PG601
To TIMER PG701
To SENSOR/MOTOR DRIVE PG141
For VPS
To F.S TUNING PG802
RF CONVERTER
RT604 LP SLOW TRACKING
RT605 SP SLOW TRACKING
RT606 F.H. CORRECT.
IC901
IC401
IC1510
IC1503
IC601
IC602
IC603
E
D
C
B
A
1
2
3
4
5
6
7
8

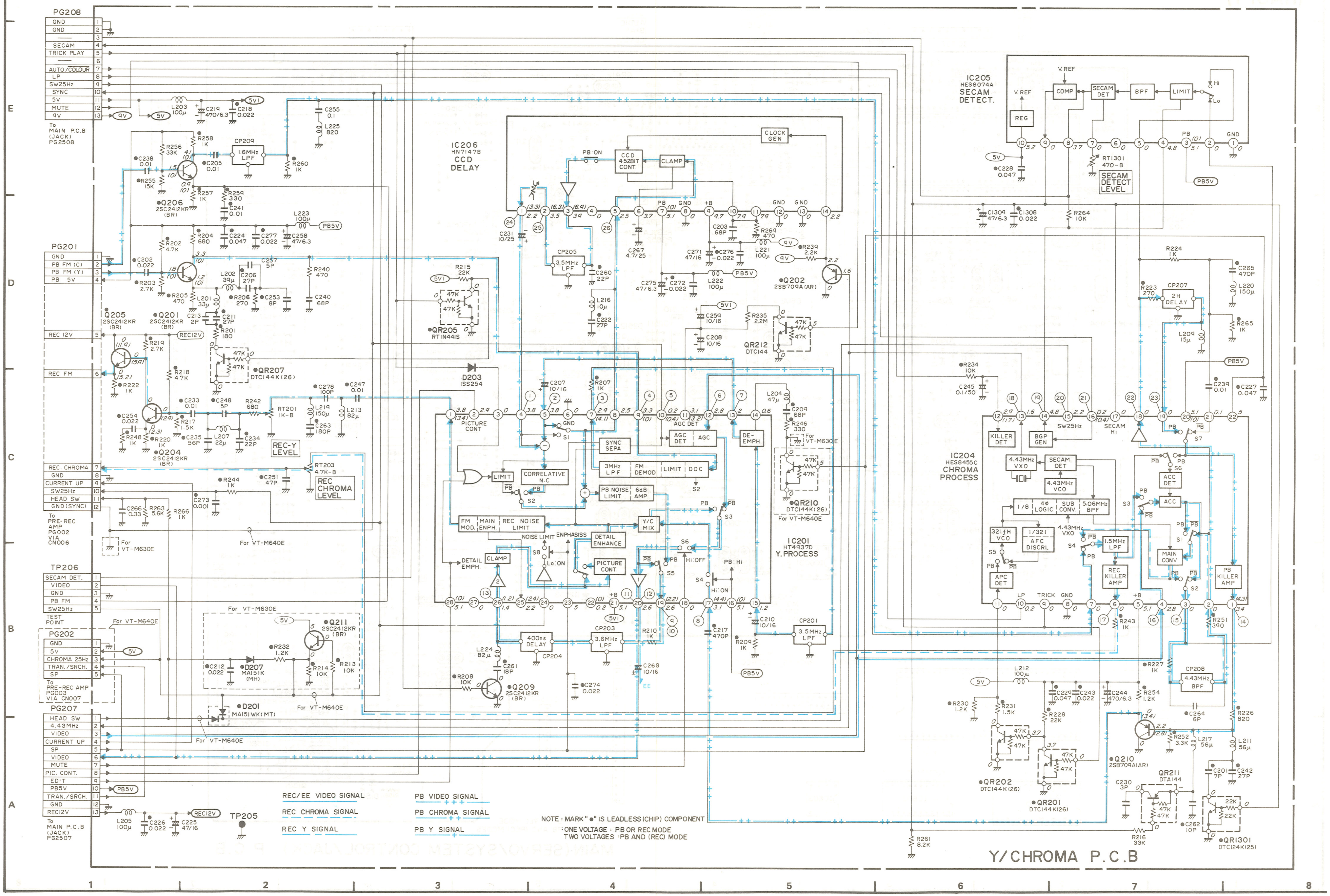
PG603
TEST POINT

1	DM. ADJ.
2	TRACK. MM
3	CTL PULSE
4	TEST
5	5V
6	SW25Hz

※ ONE VOLTAGE: PB OR REC MODE,
TWO VOLTAGES: PB AND (REC) MODES.

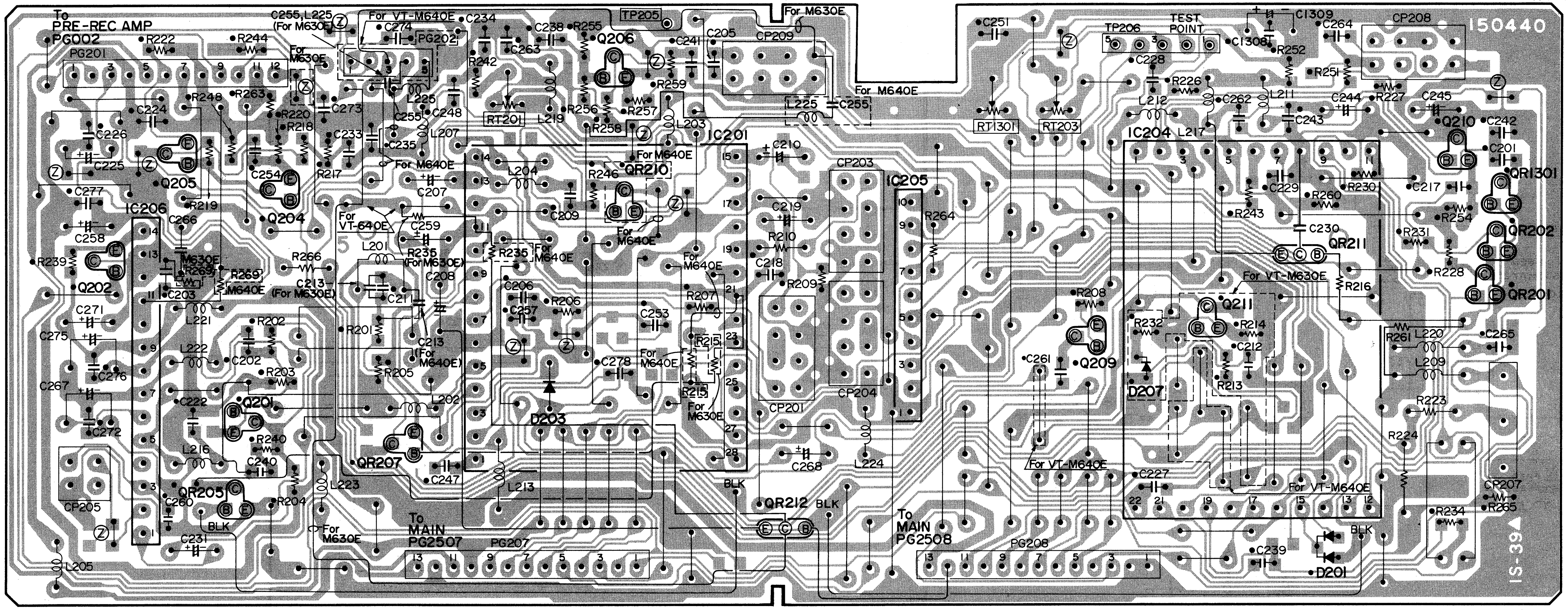
MAIN (SERVO/SYSTEM CONTROL/JACK) P.C.B

Y/CHROMA SCHEMATIC DIAGRAM (LUMINANZ/CHROMINANZ)

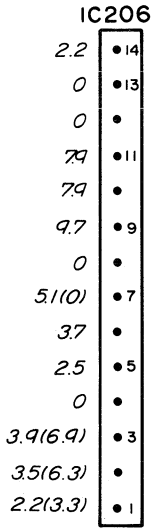

PG208
GND
GND
SECAM
TRICK PLAY
AUTO/COLOUR
LP
SW25Hz
SYNC
5V
MUTE
9V
To MAIN P.C.B (JACK) PG2508
PG201
GND
PB FM (C)
PB FM (Y)
PB 5V
REC 12V
REC FM
REC. CHROMA
GND
CURRENT UP
SW25Hz
HEAD SW
GND (SYNC)
To PRE-REC AMP PG002 VIA CN006
TP206
SECAM DET.
VIDEO
GND
PB FM
SW25Hz
TEST POINT
PG202
GND
5V
CHROMA 25Hz
TRAN./SRCH.
SP
To PRE-REC AMP PG003 VIA CN007
PG207
HEAD SW
4.43MHz
VIDEO
CURRENT UP
SP
VIDEO
MUTE
PIC. CONT.
EDIT
PB5V
TRAN./SRCH.
GND
REC12V
To MAIN P.C.B (JACK) PG2507
TP205
IC206 HN7147B CCD DELAY
CCD 452BIT CONT
CLAMP
CLOCK GEN
PB:ON
CP209 1.6MHz LPF
CP205 3.5MHz LPF
Q206 2SC2412KR (BR)
Q205 2SC2412KR (BR)
Q201 2SC2412KR (BR)
Q204 2SC2412KR (BR)
Q202 2SB709A (AR)
QR205 RTIN441S
QR207 DTC144K (26)
QR212 DTC144
QR210 DTC144K (26) For VT-M640E
D203 1SS254
RT201 1K-B
REC-Y LEVEL
RT203 4.7K-B
REC CHROMA LEVEL
IC201 HT4937D Y. PROCESS
PICTURE CONT
SYNC SEPA
AGC DET
AGC
DE-EMPH.
3MHz LPF
FM DEMOD
LIMIT
DOC
PB NOISE LIMIT
6dB AMP
LIMIT
CORRELATIVE N.C
FM MOD.
MAIN ENPH.
REC NOISE LIMIT
NOISE LIMIT
ENPHASISS
DETAIL ENHANCE
Y/C MIX
DETAIL EMPH.
CLAMP
PICTURE CONT.
Lo:ON
Hi:OFF
PB:Hi
Hi:ON
CP204 400ns DELAY
CP203 3.6MHz LPF
CP201 3.5MHz LPF
Q209 2SC2412KR (BR)
Q211 2SC2412KR (BR)
D207 MA151K (MH)
D201 MA151WK (MT)
For VT-M630E
For VT-M640E
IC205 HES8074A SECAM DETECT.
V.REF
REG
COMP
SECAM DET
BPF
LIMIT
Hi
Lo
RT1301 470-B
SECAM DETECT LEVEL
IC204 HES8455C CHROMA PROCESS
KILLER DET
BGP GEN
SW25Hz
SECAM Hi
4.43MHz VXO
SECAM DET
4.43MHz VCO
1/8
4φ LOGIC
SUB CONV.
5.06MHz BPF
ACC DET
ACC
321fH VCO
1/321
AFC DISCRI.
4.43MHz VXO
1.5MHz LPF
MAIN CONV
PB KILLER AMP
APC DET
REC KILLER AMP
LP
TRICK
GND
+B
CP207 2H DELAY
CP208 4.43MHz BPF
Q210 2SB709A (AR)
QR202 DTC144K (26)
QR201 DTC144K (26)
QR211 DTA144
QR1301 DTC124K (25)
REC/EE VIDEO SIGNAL
REC CHROMA SIGNAL
REC Y SIGNAL
PB VIDEO SIGNAL
PB CHROMA SIGNAL
PB Y SIGNAL
Y/CHROMA P.C.B
A
B
C
D
E
1
2
3
4
5
6
7
8

NOTE : MARK "●" IS LEADLESS (CHIP) COMPONENT
: ONE VOLTAGE : PB OR REC MODE
TWO VOLTAGES : PB AND (REC) MODE

Y/CHROMA CIRCUIT BOARD DIAGRAM (LUMINANZ/CHROMINANZ)


To PRE-REC AMP PG002
PG201
IC206
IC201
IC205
IC204
Q202
Q204
Q205
Q206
Q201
Q209
Q210
Q211
QR201
QR202
QR205
QR207
QR210
QR211
QR212
QR1301
D201
D203
D207
TP205
TP206
TEST POINT
RT201
RT203
RT1301
CP201
CP203
CP204
CP205
CP207
CP208
CP209
For M630E
For M640E
For VT-M640E
For VT-M630E
BLK
To MAIN PG2507
PG207
To MAIN PG2508
PG208
150440
IS-39

Y/CHROMA P.C.B

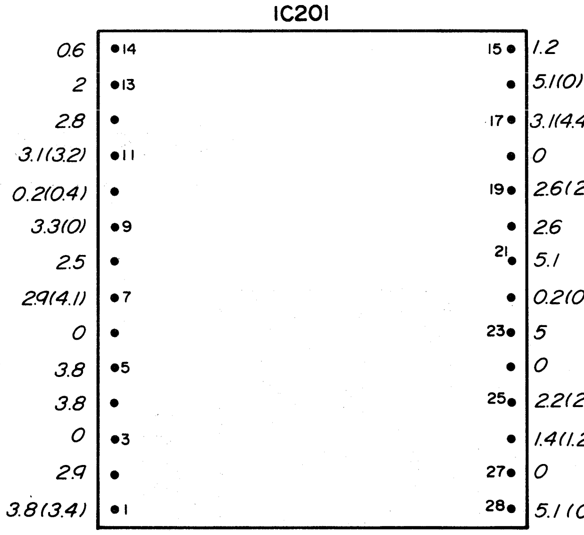

IC206
2.2 14
0 13
0
7.9 11
7.9
9.7 9
0
5.1(0) 7
3.7
2.5 5
0
3.9(6.9) 3
3.5(6.3)
2.2(3.3) 1

RT201
REC-Y LEVEL

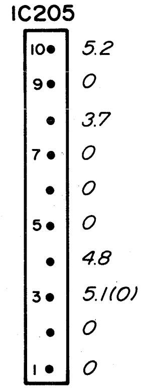
RT1301
SECAM DETECT LEVEL

※ ONE VOLTAGE: PB OR REC MODE
TWO VOLTAGES: PB AND (REC) MODE

NOTE: MARK "Ⓩ" IS LEADLESS (CHIP) JUMPER.
: MARK " ● " IS LEADLESS (CHIP) COMPONENT


IC201
0.6 14
2 13
2.8
3.1(3.2) 11
0.2(0.4)
3.3(0) 9
2.5
2.9(4.1) 7
0
3.8 5
3.8
0 3
2.9
3.8(3.4) 1
15 1.2
5.1(0)
17 3.1(4.4)
0
19 2.6(2.2)
2.6
21 5.1
0.2(0)
23 5
0
25 2.2(2.4)
1.4(1.2)
27 0
28 5.1(0)

RT203
REC CHROMA LEVEL


IC205
10 5.2
9 0
3.7
7 0
0
5 0
4.8
3 5.1(0)
0
1 0

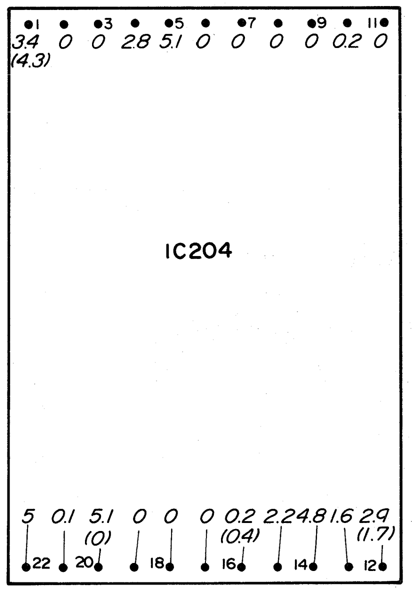
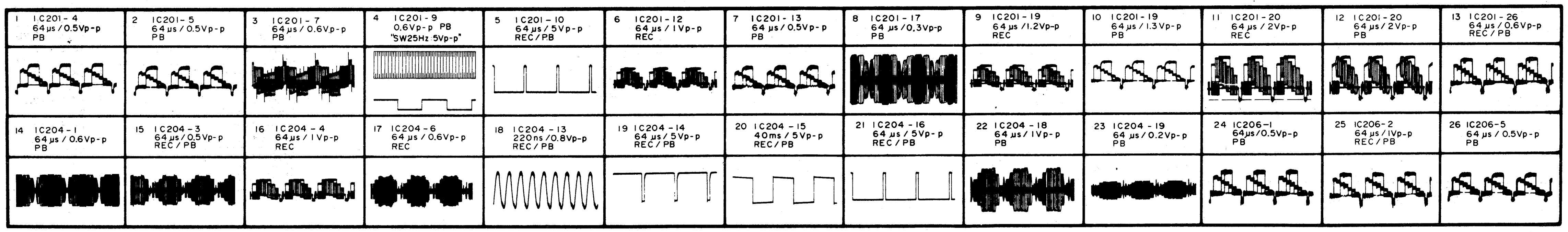

IC204
1 3.4 (4.3)
0
3 0
2.8
5 5.1
0
7 0
0
9 0
0.2
11 0
22 5
0.1
20 5.1 (0)
0
18 0
0
16 0.2 (0.4)
2.2
14 4.8
1.6
12 2.9 (1.7)

DIAGRAM CONFIGURATION	SCHEMATIC	CIRCUIT BOARD
F.S TUNING	5-3	5-4
TIMER	5-5	5-7
JACK	5-9	5-19,23
AUDIO	5-11	5-19,23
SLOW DRIVE	5-12	5-12
SERVO	5-13	5-19,23
SENSOR/MOTOR DRIVE	5-15	5-16
CAPSTAN MOTOR DRIVE	5-16	
SYSTEM CONTROL	5-17	5-19,23
PRE-REC AMP	5-21	
Y/CHROMA	5-25	5-27
REGULATOR	5-29	5-29
REMOTE CONTROL	5-31	
IF UNIT	5-32	
TUNER UNIT	5-33	
RF CONVERTER	5-35	

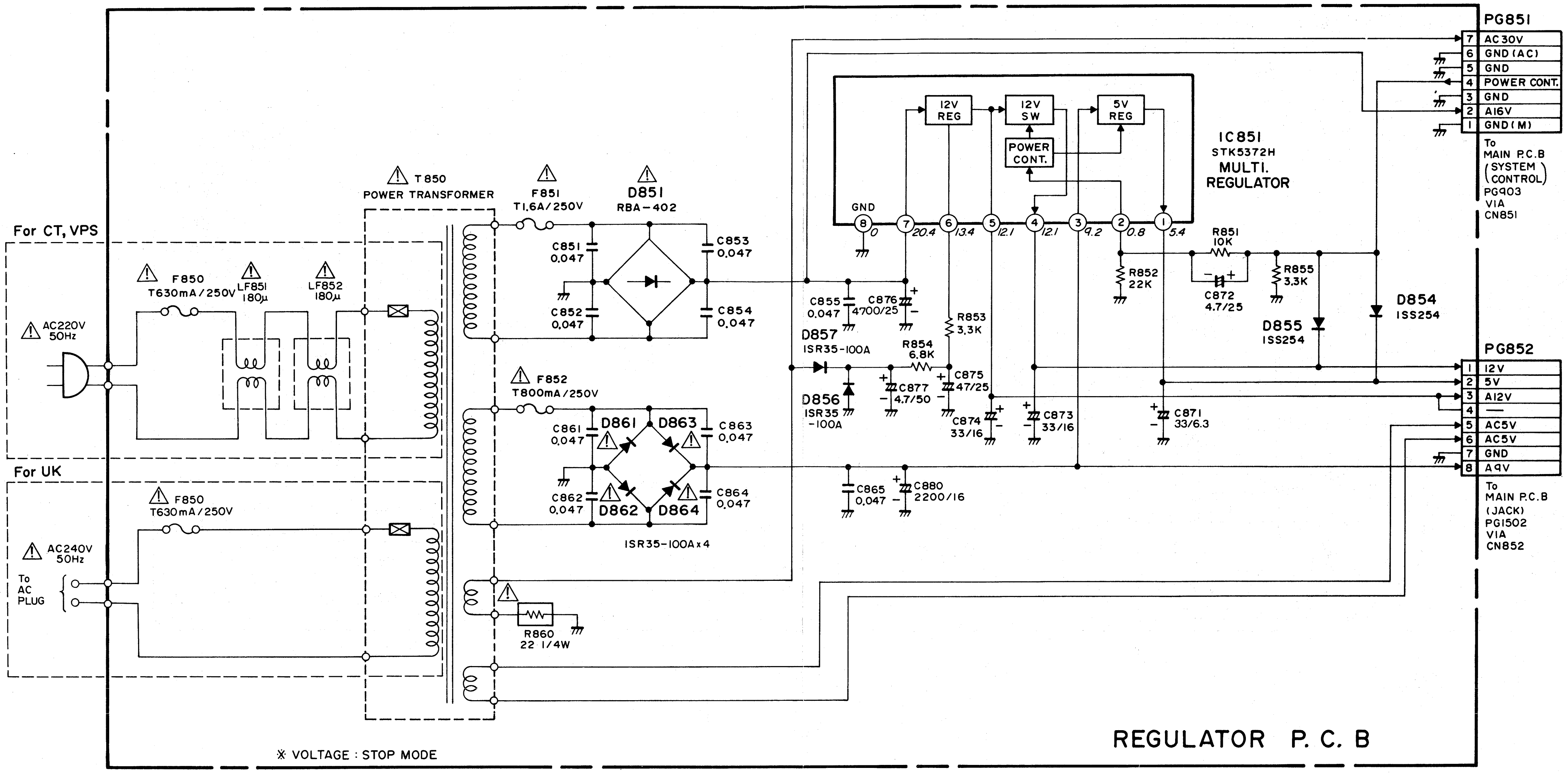


WAVEFORM MEASUREMENT CONDITION

REC : Apply 1Vp-p colour bar signal.

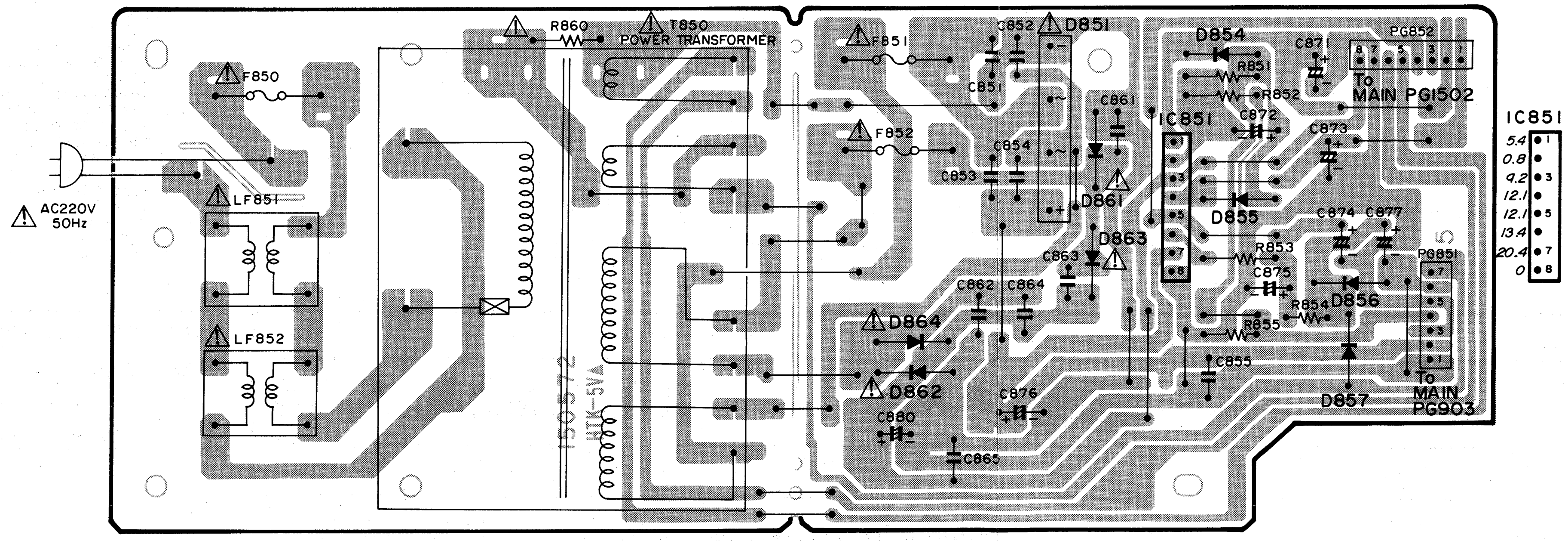
PB : Play colour bar signal of PAL alignment tape.

REGULATOR SCHEMATIC DIAGRAM (REGLER)


PG851
7 AC30V
6 GND (AC)
5 GND
4 POWER CONT.
3 GND
2 A16V
1 GND (M)
To MAIN P.C.B (SYSTEM CONTROL) PG903 VIA CN851
12V REG
12V SW
5V REG
POWER CONT.
IC851
STK5372H
MULTI. REGULATOR
GND
8 7 6 5 4 3 2 1
0 20.4 13.4 12.1 12.1 9.2 0.8 5.4
T850 POWER TRANSFORMER
F851 T1.6A/250V
D851 RBA-402
C851 0.047
C852 0.047
C853 0.047
C854 0.047
C855 0.047
C876 4700/25
R853 3.3K
R854 6.8K
D857 ISR35-100A
D856 ISR35 -100A
C877 4.7/50
C875 47/25
C874 33/16
C873 33/16
C871 33/6.3
R851 10K
R852 22K
C872 4.7/25
R855 3.3K
D855 1SS254
D854 1SS254
PG852
1 12V
2 5V
3 A12V
4 —
5 AC5V
6 AC5V
7 GND
8 A9V
To MAIN P.C.B (JACK) PG1502 VIA CN852
For CT, VPS
AC220V 50Hz
F850 T630mA/250V
LF851 180μ
LF852 180μ
F852 T800mA/250V
C861 0.047
C862 0.047
C863 0.047
C864 0.047
D861 D863 D862 D864
ISR35-100A×4
C865 0.047
C880 2200/16
For UK
F850 T630mA/250V
AC240V 50Hz
To AC PLUG
R860 22 1/4W
REGULATOR P. C. B

※ VOLTAGE : STOP MODE

REGULATOR CIRCUIT BOARD DIAGRAM (REGLER)

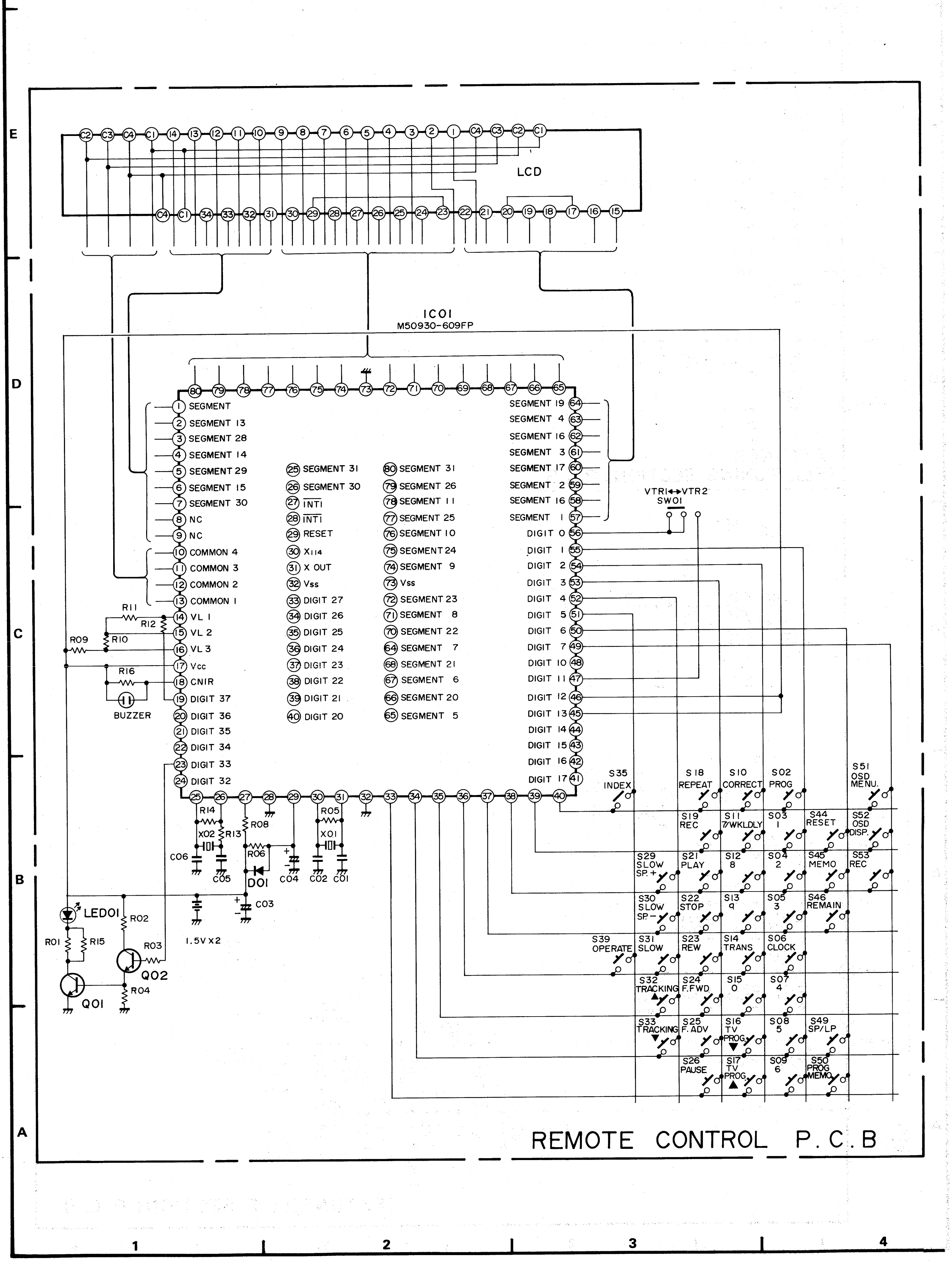

R860
T850 POWER TRANSFORMER
F850
AC220V 50Hz
LF851
LF852
F851
F852
C852 D851
C851
C861
C854
C853
D861
D863
C863
C862 C864
D864
D862
C880
C876
C865
D854
C871
R851
R852
To MAIN PG1502
PG852 8 7 5 3 1
IC851
C872
C873
D855
C874 C877
R853
C875
R854 D856
R855
C855
PG851
D857
To MAIN PG903
IC851
5.4 1
0.8 2
9.2 3
12.1 4
12.1 5
13.4 6
20.4 7
0 8
150572
HTK-5V

※ VOLTAGE : STOP MODE

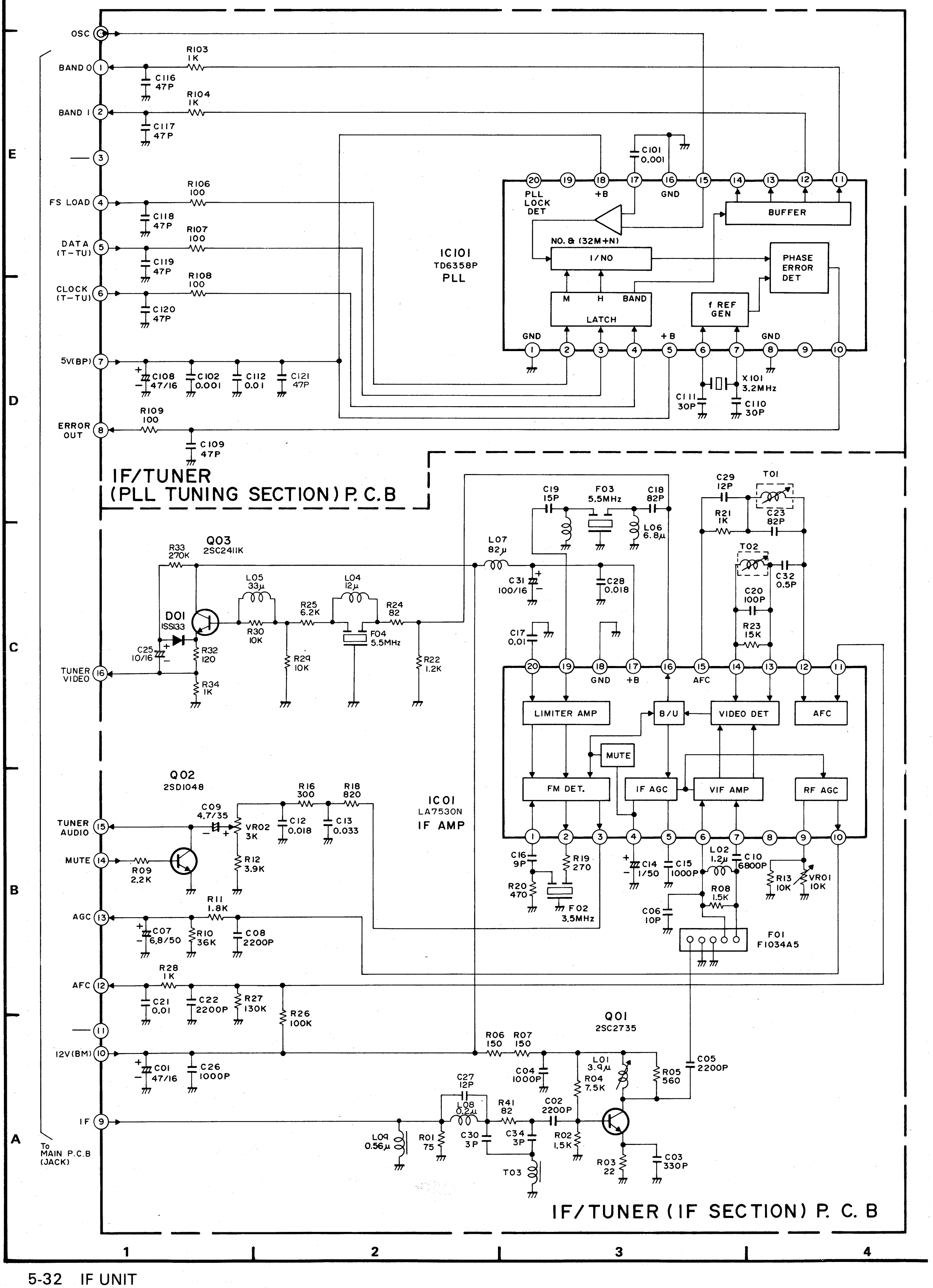
REGULATOR P. C. B

DIAGRAM CONFIGURATION	SCHEMATIC	CIRCUIT BOARD
F.S TUNING	5 – 3	/5 – 4
TIMER	5 – 5	/5 – 7
JACK	5 – 9	/5 – 19,23
AUDIO	5 – 11	/5 – 19,23
SLOW DRIVE	5 – 12	/5 – 12
SERVO	5 – 13	/5 – 19,23
SENSOR/MOTOR DRIVE	5 – 15	/5 – 16
CAPSTAN MOTOR DRIVE	5 – 16	/
SYSTEM CONTROL	5 – 17	/5 – 19,23
PRE–REC AMP	5 – 21	/
Y/CHROMA	5 – 25	/5 – 27
REGULATOR	5 – 29	/5 – 29
REMOTE CONTROL	5 – 31	/
IF UNIT	5 – 32	/
TUNER UNIT	5 – 33	/
RF CONVERTER	5 – 35	/

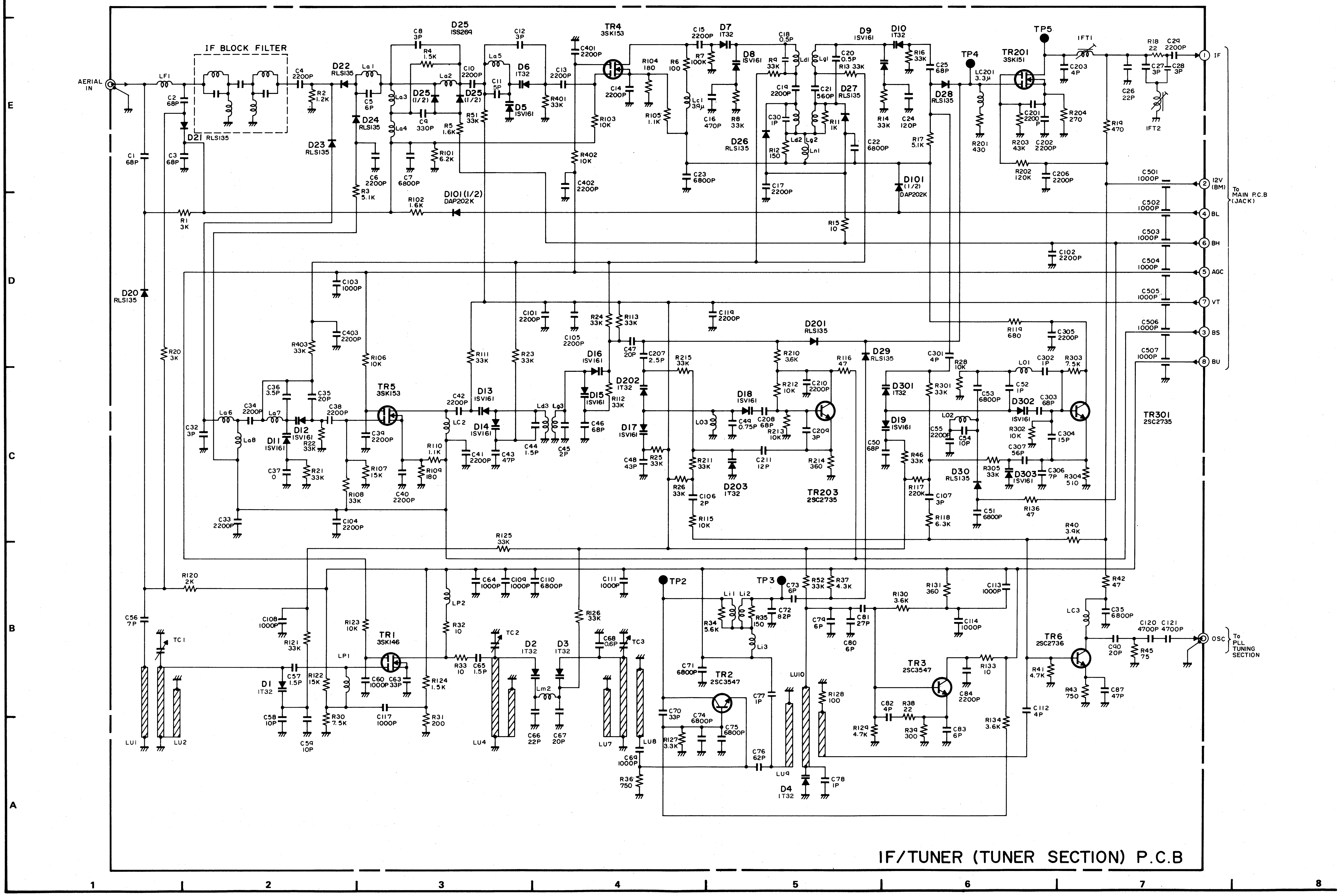
REMOTE CONTROL SCHEMATIC DIAGRAM (FERNBEDIENUNG)


E
D
C
B
A
1
2
3
4
LCD
C1
C2
C3
C4
BUZZER
IC01
M50930-609FP
1 SEGMENT
2 SEGMENT 13
3 SEGMENT 28
4 SEGMENT 14
5 SEGMENT 29
6 SEGMENT 15
7 SEGMENT 30
8 NC
9 NC
10 COMMON 4
11 COMMON 3
12 COMMON 2
13 COMMON 1
14 VL 1
15 VL 2
16 VL 3
17 Vcc
18 CNIR
19 DIGIT 37
20 DIGIT 36
21 DIGIT 35
22 DIGIT 34
23 DIGIT 33
24 DIGIT 32
25 SEGMENT 31
26 SEGMENT 30
27 INT1
28 INT1
29 RESET
30 X114
31 X OUT
32 Vss
33 DIGIT 27
34 DIGIT 26
35 DIGIT 25
36 DIGIT 24
37 DIGIT 23
38 DIGIT 22
39 DIGIT 21
40 DIGIT 20
80 SEGMENT 31
79 SEGMENT 26
78 SEGMENT 11
77 SEGMENT 25
76 SEGMENT 10
75 SEGMENT 24
74 SEGMENT 9
73 Vss
72 SEGMENT 23
71 SEGMENT 8
70 SEGMENT 22
64 SEGMENT 7
68 SEGMENT 21
67 SEGMENT 6
66 SEGMENT 20
65 SEGMENT 5
SEGMENT 19 64
SEGMENT 4 63
SEGMENT 16 62
SEGMENT 3 61
SEGMENT 17 60
SEGMENT 2 59
SEGMENT 16 58
SEGMENT 1 57
DIGIT 0 56
DIGIT 1 55
DIGIT 2 54
DIGIT 3 53
DIGIT 4 52
DIGIT 5 51
DIGIT 6 50
DIGIT 7 49
DIGIT 10 48
DIGIT 11 47
DIGIT 12 46
DIGIT 13 45
DIGIT 14 44
DIGIT 15 43
DIGIT 16 42
DIGIT 17 41
VTR1↔VTR2
SW01
R09
R10
R11
R12
R16
R14
R13
R08
R06
R05
X02
X01
C06
C05
C04
C02
C01
D01
C03
1.5V X2
LED01
R01
R15
R02
R03
Q02
R04
Q01
S35 INDEX
S18 REPEAT
S10 CORRECT
S02 PROG
S51 OSD MENU.
S19 REC
S11 7/WKLDLY
S03 1
S44 RESET
S52 OSD DISP.
S29 SLOW SP.+
S21 PLAY
S12 8
S04 2
S45 MEMO
S53 REC
S30 SLOW SP.−
S22 STOP
S13 9
S05 3
S46 REMAIN
S39 OPERATE
S31 SLOW
S23 REW
S14 TRANS
S06 CLOCK
S32 TRACKING ▲
S24 F.FWD
S15 0
S07 4
S33 TRACKING ▼
S25 F. ADV
S16 TV PROG. ▼
S08 5
S49 SP/LP
S26 PAUSE
S17 TV PROG. ▲
S09 6
S50 PROG MEMO
REMOTE CONTROL P.C.B

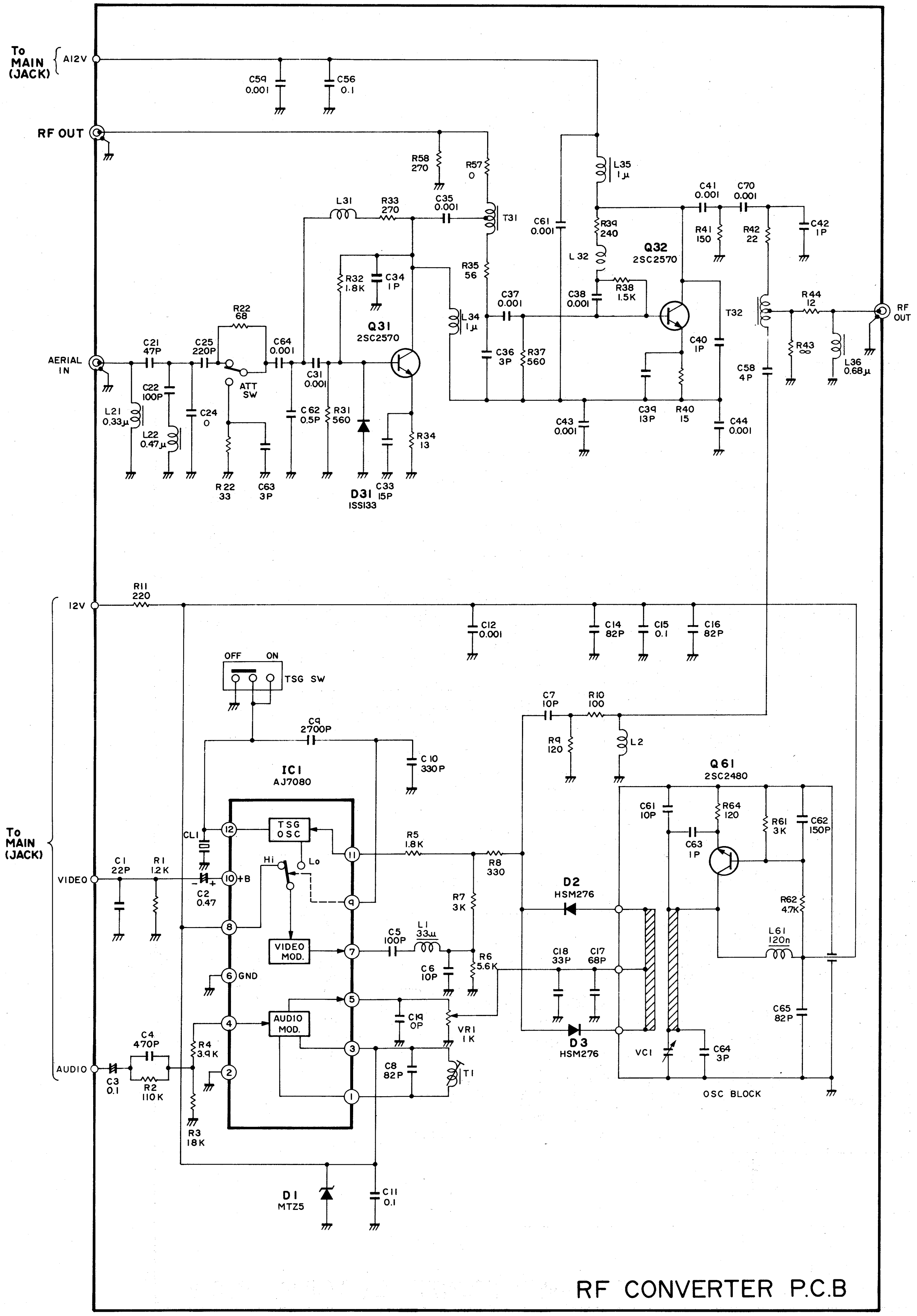
IF UNIT SCHEMATIC DIAGRAM (ZF-EINHEIT)


OSC
BAND 0 ①
BAND 1 ②
③
FS LOAD ④
DATA (T-TU) ⑤
CLOCK (T-TU) ⑥
5V(BP) ⑦
ERROR OUT ⑧
R103 1K
R104 1K
R106 100
R107 100
R108 100
R109 100
C116 47P
C117 47P
C118 47P
C119 47P
C120 47P
C108 47/16
C102 0.001
C112 0.01
C121 47P
C109 47P
C101 0.001
IC101 TD6358P PLL
PLL LOCK DET
+B
GND
BUFFER
NO. 8 (32M+N)
1/NO
PHASE ERROR DET
M
H
BAND
LATCH
f REF GEN
X101 3.2MHz
C111 30P
C110 30P
IF/TUNER (PLL TUNING SECTION) P. C. B
Q03 2SC2411K
R33 270K
D01 1SS133
C25 10/16
R32 120
R34 1K
TUNER VIDEO ⑯
L05 33μ
R30 10K
R25 6.2K
L04 12μ
R24 82
F04 5.5MHz
R29 10K
R22 1.2K
L07 82μ
C31 100/16
C28 0.018
C17 0.01
C19 15P
F03 5.5MHz
C18 82P
L06 6.8μ
C29 12P
T01
R21 1K
C23 82P
T02
C32 0.5P
C20 100P
R23 15K
IC01 LA7530N IF AMP
AFC
LIMITER AMP
B/U
VIDEO DET
MUTE
FM DET.
IF AGC
VIF AMP
RF AGC
C16 9P
R19 270
R20 470
F02 3.5MHz
C14 1/50
C15 1000P
L02 1.2μ
C10 6800P
R08 1.5K
R13 10K
VR01 10K
C06 10P
F01 F1034A5
Q02 2SD1048
TUNER AUDIO ⑮
MUTE ⑭
C09 4.7/35
VR02 3K
R16 300
R18 820
C12 0.018
C13 0.033
R12 3.9K
R09 2.2K
AGC ⑬
R11 1.8K
C07 6.8/50
R10 36K
C08 2200P
AFC ⑫
R28 1K
C21 0.01
C22 2200P
R27 130K
R26 100K
⑪
12V(BM) ⑩
C01 47/16
C26 1000P
IF ⑨
To MAIN P.C.B (JACK)
Q01 2SC2735
R06 150
R07 150
C04 1000P
L01 3.9μ
R05 560
C05 2200P
R04 7.5K
C27 12P
L08 0.2μ
R41 82
C02 2200P
L09 0.56μ
R01 75
C30 3P
C34 3P
T03
R02 1.5K
R03 22
C03 330P
IF/TUNER (IF SECTION) P. C. B
E
D
C
B
A
1
2
3
4

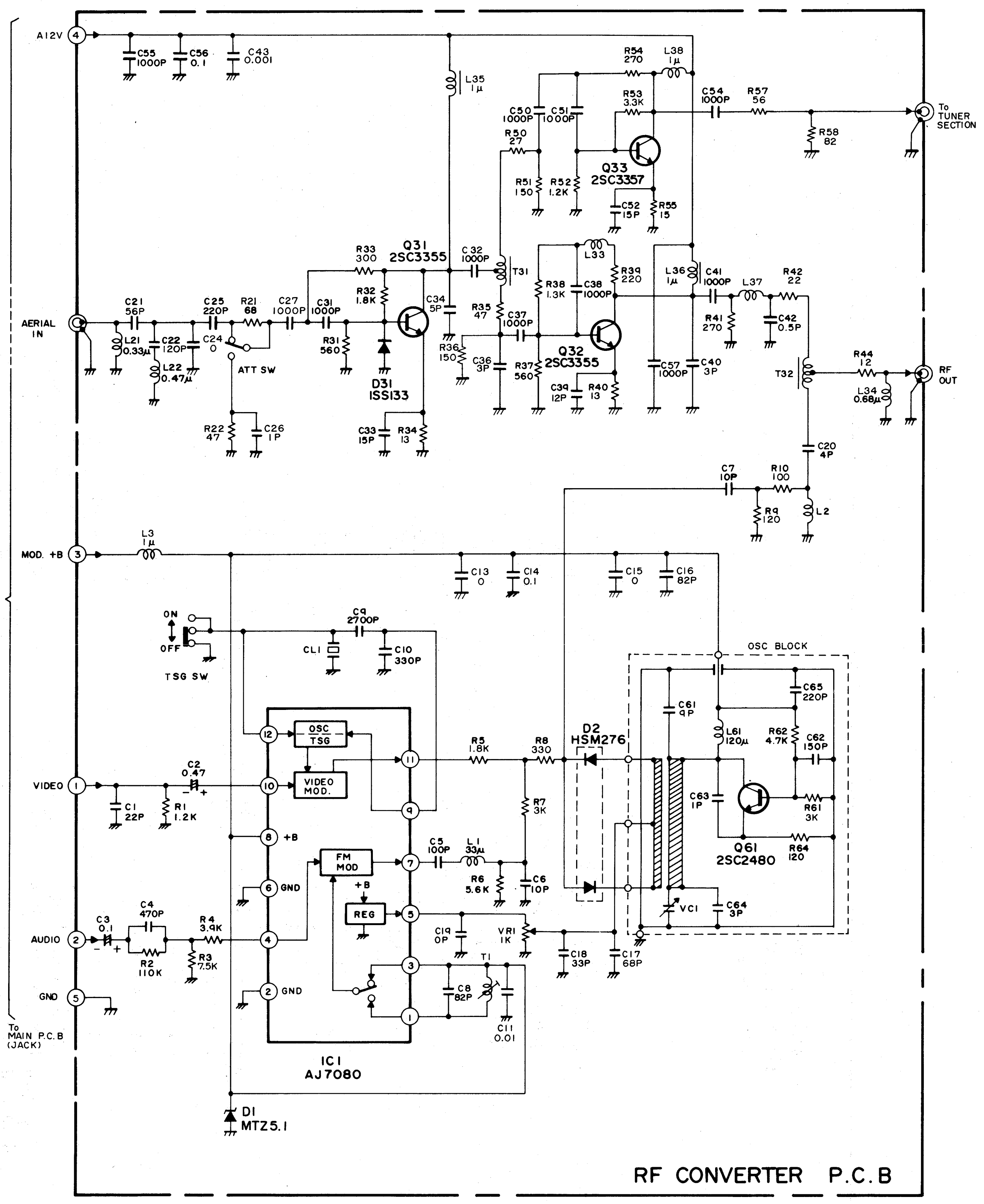
TUNER UNIT SCHEMATIC DIAGRAM (TUNER-EINHEIT)


AERIAL IN
LF1
IF BLOCK FILTER
C1 68P
C2 68P
C3 68P
D21 RLS135
C4 2200P
R2 1.2K
D22 RLS135
La1
C5 6P
D24 RLS135
La3
La4
C6 2200P
R3 5.1K
D23 RLS135
R1 3K
C8 3P
D25 1SS264
R4 1.5K
La2
C9 330P
D25 (1/2)
D25 (1/2)
R5 1.6K
C7 6800P
R101 6.2K
C10 2200P
C11 5P
La5
C12 3P
D6 1T32
D5 1SV161
R51 33K
R401 33K
C13 2200P
C401 2200P
TR4 3SK153
C14 2200P
R104 180
R103 10K
R402 10K
C402 2200P
R105 1.1K
C15 2200P
D7 1T32
R6 100
R7 100K
D8 1SV161
Lc1 39μ
C16 470P
R8 33K
C23 6800P
C18 0.5P
Ld1
R9 33K
C19 2200P
C30 1P
R12 150
Ld2
Lg2
Ln1
C17 2200P
D26 RLS135
Lg1
C20 0.5P
R13 33K
C21 560P
D27 RLS135
R11 1K
C22 6800P
R15 10
D9 1SV161
D10 1T32
R16 33K
R14 33K
C24 120P
C25 68P
R17 5.1K
D101 (1/2) DAP202K
TP4
LC201 3.3μ
D28 RLS135
R201 430
TP5
TR201 3SK151
C201 2200P
R203 43K
C202 2200P
R204 270
R202 120K
C206 2200P
C203 4P
IFT1
C26 22P
R18 22
C29 2200P
C27 3P
C28 3P
IFT2
R19 470
① IF
C501 1000P
② 12V (BM)
C502 1000P
④ BL
C503 1000P
⑥ BH
C504 1000P
⑤ AGC
C505 1000P
⑦ VT
C506 1000P
③ BS
C507 1000P
⑧ BU
To MAIN P.C.B (JACK)
R102 1.6K
D101 (1/2) DAP202K
C102 2200P
D20 RLS135
C103 1000P
C403 2200P
R403 33K
R20 3K
C101 2200P
C105 2200P
R24 33K
R113 33K
C119 2200P
D201 RLS135
R119 680
C305 2200P
La6
La8
C32 3P
C34 2200P
La7
C36 3.5P
C35 20P
D11 1SV161
D12 1SV161
R22 33K
C38 2200P
C37 0
R21 33K
C33 2200P
R106 10K
TR5 3SK153
C39 2200P
R107 15K
R108 33K
C40 2200P
R109 180
R110 1.1K
C104 2200P
R111 33K
R23 33K
C42 2200P
LC2
D13 1SV161
D14 1SV161
C41 2200P
C43 47P
Ld3
Lg3
C44 1.5P
C45 2P
D16 1SV161
D15 1SV161
C46 68P
R112 33K
D17 1SV161
C48 43P
R25 33K
C47 20P
C207 2.5P
D202 1T32
R215 33K
R210 3.6K
R212 10K
C210 2200P
D18 1SV161
C49 0.75P
C208 68P
R213 10K
L03
TR203 2SC2735
C209 3P
C211 12P
R211 33K
R26 33K
D203 1T32
R214 360
C106 2P
R115 10K
R116 47
D29 RLS135
C301 4P
D301 1T32
D19 1SV161
C50 68P
R46 33K
R117 220K
C107 3P
R118 6.3K
R28 10K
R301 33K
L01
C302 1P
R303 7.5K
C53 6800P
C52 1P
D302 1SV161
C303 68P
L02
C55 2200P
C54 10P
R302 10K
C304 15P
C307 56P
D30 RLS135
R305 33K
D303 1SV161
C306 7P
R304 510
C51 6800P
R136 47
R40 3.9K
TR301 2SC2735
R125 33K
R120 2K
C56 7P
TC1
LU1
LU2
C108 1000P
R121 33K
D1 1T32
C57 1.5P
C58 10P
C59 10P
R122 15K
R30 7.5K
LP1
R123 10K
TR1 3SK146
C60 1000P
C63 33P
C117 1000P
R124 1.5K
R31 200
C64 1000P
C109 1000P
C110 6800P
LP2
R32 10
R33 10
C65 1.5P
TC2
D2 1T32
Lm2
D3 1T32
C66 22P
C67 20P
LU4
C111 1000P
R126 33K
C68 0.6P
TC3
LU7
LU8
C69 1000P
R36 750
TP2
Li1
Li2
R34 5.6K
R35 150
Li3
C71 6800P
TR2 2SC3547
C70 33P
C74 6800P
C75 6800P
R127 3.3K
C77 1P
C76 62P
LU9
LU10
TP3
C73 6P
C72 82P
R52 33K
R37 4.3K
C79 6P
C81 27P
C80 6P
D4 1T32
C78 1P
R128 100
R130 3.6K
R131 360
C113 1000P
C114 1000P
TR3 2SC3547
R133 10
C84 2200P
C82 4P
R38 22
R129 4.7K
R39 300
C83 6P
R134 3.6K
C112 4P
R42 47
LC3
C35 6800P
TR6 2SC2736
R41 4.7K
R43 750
C87 47P
C90 20P
R45 75
C120 4700P
C121 4700P
OSC
To PLL TUNING SECTION
IF/TUNER (TUNER SECTION) P.C.B
E
D
C
B
A
1
2
3
4
5
6
7
8

RF CONVERTER SCHEMATIC DIAGRAM (HF-KONVERTER) For CT


To MAIN (JACK)
A12V
C59 0.001
C56 0.1
RF OUT
R58 270
R57 0
L35 1μ
L31
R33 270
C35 0.001
T31
C41 0.001
C70 0.001
C42 1P
C61 0.001
R39 240
R41 150
R42 22
L32
Q32 2SC2570
R32 1.8K
C34 1P
R35 56
C37 0.001
C38 0.001
R38 1.5K
T32
R44 12
RF OUT
R22 68
Q31 2SC2570
L34 1μ
C40 1P
R43 ∞
AERIAL IN
C21 47P
C25 220P
C64 0.001
C31 0.001
C36 3P
R37 560
C58 4P
L36 0.68μ
C22 100P
ATT SW
C62 0.5P
R31 560
L21 0.33μ
C24 0
C39 13P
R40 15
C44 0.001
L22 0.47μ
R34 13
C43 0.001
R22 33
C63 3P
D31 1SS133
C33 15P
12V
R11 220
C12 0.001
C14 82P
C15 0.1
C16 82P
OFF
ON
TSG SW
C7 10P
R10 100
C9 2700P
C10 330P
R9 120
L2
IC1 AJ7080
Q61 2SC2480
To MAIN (JACK)
CL1
TSG OSC
C61 10P
R64 120
R61 3K
C62 150P
R5 1.8K
C63 1P
VIDEO
C1 22P
R1 12K
Hi
Lo
R8 330
D2 HSM276
R62 4.7K
C2 0.47
+B
R7 3K
VIDEO MOD.
C5 100P
L1 33μ
L61 120n
GND
C18 33P
C17 68P
C6 10P
R6 5.6K
C4 470P
AUDIO MOD.
C19 0P
C65 82P
R4 3.9K
VR1 1K
D3 HSM276
AUDIO
C3 0.1
R2 110K
C8 82P
T1
VC1
C64 3P
OSC BLOCK
R3 18K
D1 MTZ5
C11 0.1
RF CONVERTER P.C.B

RF CONVERTER SCHEMATIC DIAGRAM (HF-KONVERTER) For VPS


A12V
C55 1000P
C56 0.1
C43 0.001
L35 1μ
R54 270
L38 1μ
R53 3.3K
C54 1000P
R57 56
To TUNER SECTION
C50 1000P
C51 1000P
R58 82
R50 27
Q33 2SC3357
R51 150
R52 1.2K
C52 15P
R55 15
R33 300
Q31 2SC3355
C32 1000P
L33
T31
R39 220
L36 1μ
C41 1000P
L37
R42 22
AERIAL IN
C21 56P
C25 220P
R21 68
C27 1000P
C31 1000P
R32 1.8K
C34 5P
R38 1.3K
C38 1000P
L21 0.33μ
C22 120P
C24 0
R35 47
C37 1000P
R41 270
C42 0.5P
L22 0.47μ
ATT SW
R31 560
R36 150
C36 3P
R37 560
Q32 2SC3355
C57 1000P
C40 3P
T32
R44 12
RF OUT
D31 1SS133
C39 12P
R40 13
L34 0.68μ
R22 47
C26 1P
C33 15P
R34 13
C20 4P
C7 10P
R10 100
R9 120
L2
MOD. +B
L3 1μ
C13 0
C14 0.1
C15 0
C16 82P
ON
OFF
TSG SW
C9 2700P
CL1
C10 330P
OSC BLOCK
C61 9P
C65 220P
OSC TSG
L61 120μ
R62 4.7K
C62 150P
R5 1.8K
R8 330
D2 HSM276
VIDEO
C2 0.47
VIDEO MOD.
C63 1P
R61 3K
C1 22P
R1 1.2K
R7 3K
Q61 2SC2480
R64 120
+B
FM MOD
C5 100P
L1 33μ
GND
R6 5.6K
C6 10P
+B
AUDIO
C3 0.1
C4 470P
R4 3.9K
REG
C19 0P
VR1 1K
VC1
C64 3P
R2 110K
R3 7.5K
C18 33P
C17 68P
T1
GND
GND
C8 82P
To MAIN P.C.B (JACK)
C11 0.01
IC1 AJ7080
D1 MTZ5.1
RF CONVERTER P.C.B

SERVICE MANUAL ABBREVIATION LIST

A	
A.DUB	Audio Dub
ACC	Automatic Colour Control
ACK	Automatic Colour Killer
ADD	Adder
AFC	Automatic Frequency Control
AGC	Automatic Gain Control
ALC	Automatic Level Control
ASBL	Assemble (Phase Matching)
APC	Automatic Phase Control
AUX	Auxiliary
B	
BATT.	Battery
BG	Burst Gate
BGP	Burst Gate Pulse
BH	Power Supply for Selecting VHF High Band
BL	Power Supply for Selecting VHF Low Band
BPF	Band- pass Filter
BS	Power Supply for Selecting VHF Super Band
BU	Power Supply for Selecting UHF Band
BUF.	Buffer Amplifier
C	
C	Chroma
C.FG/CFG	Capstan Frequency Generater
C.MEMORY	Counter Memory
C.PAUSE	Camera Pause
C.RESET	Counter Reset
C.REVERSE	Count Reverse
C.SYNC	Composite Synchronizing Signal
C/R	Capacitor/Resistor
CATV	Cable TV
CAPST.	Capstan
CCD	Charge Coupled Device
CH	Channel
CHAR.	Character
COM.	Common
COMP-EXP	Compressor-Expander
COMP.	Comparator
COMPE	Compensator
COMP.	Composite
COUNT.	Counter
CST	Cassette
CTL	Control Track Pulse
CYL.	Cylinder
D	
D/A	Digital to Analog
DEEMPH.	Deemphasis
DEMOD.	Demodulator
DET	Detector
DISP.	Display
DL	Delay line
DN	Down
DO	Dropout
DOC	Dropout Compensator
E	
E-E	Electronic-to-Electronic
EA-ROM	Electrically Alterable Read Only Memory
EMPH	Emphasis
EQ	Equalizer
EXT.	External
F	
FF	Flip Flop
F.FWD	Fast Forward
FG	Frequency Generator
FM	Frequency Modulation
FRAME ADV./F.ADV	Frame Advance
fsc	Sub Carrier Frequency
FWD	Forward
G	
GEN	Generator
GND	Ground
H	
HD	Horizontal Drive
Hi-Fi	High Fidelity
HPF	High-pass Filter
HPL	High-pass Limiter
HSS	Horizontal Sync. Separator
I	
I/O	In/Out
IF	Intermediate Frequency
INDI.	Indicator
INT.	Internal
INV.	Inverter
IR	Infrared Rays
IRT	Instant Recording Timer
L	
LCD	Liquid Crystal Display
LIN.	Linear
LM	Loading Motor
LOG.	Logarithm
LPF	Low-pass Filter
L/R	Left/Right
LP	Long play
M	
M.CUT	Monitor Cut
M.STATE	Mechanism State
M.STOP	Memory Stop
MEM.	Memory
MIX	Mixer
MM	Monostable Multivibrator
MOD.	Modulator
MPX	Multiplex
N	
NF	Negative Feed Back
NORM.	Normal
NR	Noise Reduction

O	
OSC	Oscillator
OSD	On-Screen Display
P	
PB/PLAY	Playback
PIF	Picture Intermediate Frequency
PLL	Phase Locked Loop
POS.	Positive
POWER CONT.	Power Control
PROG.	Programme
PROTECT.	Protector
PWM	Pulse Width Modulation
R	
REC	Record
RECT.	Rectifier
REF	Reference
REG	Regulator
REV	Reverse
REW	Rewind
RF	Radio Frequency
RAM	Randum Access Memorey
ROM	Read Only Memory
S	
S/H	Sample and Hold
S.REEL	Supply Reel Sensor
S.TRACK.	Slow Tracking
S-VHS	Super VHS
SAW	Sawtooth
SEP.	Separator
SIF	Sound Intermediate Frequency
SP	Standard Play
SRCH	Search
SRV	Servo
SW 25Hz	Head Switching Pulse
SYNC	Synchronizing Signal
SYS.CON	System Control
T	
T/L	Tuner/Line
T.BRAKE	Take-up Brake
Tμp	Timer Microprocessor
T.REEL	Take-up Reel Sensor
T.RESET	Timer Reset
TP	Test Point
TRS	Transfer
TU-μP	Tuning Microprocessor
U	
U/D	Up/Down
UNI.	Unified
V	
V-REF	Voltage Reference
V.DRV	Vertical Drive Pulse
V.DUB	Video Dub
VCO	Voltage Controlled Oscillator
VHS	Video Home Systems
Vss	Voltage Super Source
VOL.	Volume
VSS	Vertical Sync. Separator
VT	Tuning Voltage
VT-U	Tuning Voltage-UHF
VT-V	Tuning Voltage-VHF
Y	
Y/C	Luminance/Chrominance

DIGITAL PROCESS CIRCUIT

A	
ADC B-Y	Analog to Digital Converted B-Y Signal
ADC R-Y	Analog to Digital Converted R-Y Signal
ADC Y	Analog to Digital Converted Luminance
ADRS	Address
C	
CAS	Column Address Strobe
C.BLANK	Chroma Blanking
D	
DRAM	Dynamic Random Access Memory
DEMPX	Demultiplexer
DWC	Delayed Write Clock
DT/OE	Date Transfer /Output Enable
D.REF 25	Delayed Reference 25Hz
D.SW 25	Delayed Switching 25Hz
I	
INC	Row Counter Increment
M	
MEM	Memory
MEM VIDEO	Memorized Video
MEM SW	Memory Switch
MEM ON	Memory ON
MPX	Multiplexer
MPX VIDEO	Multiplexed Video
O	
O/E	Odd/Even Field
P	
P IN P	Picture in Picture
PIX MOVE	Picture Move
R	
RC	Reading Clock
RCC	Reading Clock Clear
RCR	Row Counter Reset
RAS	Row Address strobe
REF 25	Reference 25Hz from servo circuit
REL	Refresh Control
S	
SC	Serial Control
W	
WC	Write Clock
WCC	Write Clock Clear
WRITE ENBL (WE)	Write Enable

REPLACEMENT PARTS LIST(ERSATZTEILLISTE) -VT-M63XE-

ELECTRICAL PARTS LIST(LISTE DER ELEKTRISCHEN TEILE)

CAPACITORS

SYMBOL-NO	P-NO	DESCRIPTION	
C 202	0209855	CERAMIC CHIP	0.022UF+-20% 25V
C 205	0209838	CERAMIC CHIP	0.01UF+-20% 50V
C 206	0201024	CERAMIC CHIP	27PF+-5% 50V
C 209	0201025	CERAMIC CHIP	68PF+-5% 50V1
C 211	0201024	CERAMIC CHIP	27PF+-10% 50V
C 217	0209834	CERAMIC DISC	470PF+-10% 12V
C 218	0209855	CERAMIC CHIP	0.022UF+-20% 25V
C 222	0209894	CERAMIC CHIP	27PF+-10% 50V
C 233	0201007	CERAMIC CHIP	0.01UF+-20% 50V
C 234	0209893	CERAMIC CHIP	22PF+-10% 50V
C 235	0201028	CERAMIC CHIP	56PF+-10% 50V
C 238	0209828	CERAMIC CHIP	0.01UF+80-20% 50V
C 239	0209838	CERAMIC CHIP	0.01UF+-20% 50V
C 241	0209838	CERAMIC CHIP	0.01UF+-20% 50V
C 242	0209894	CERAMIC CHIP	27PF+-10% 50V
C 243	0209855	CERAMIC CHIP	0.022UF+-20% 25V
C 247	0209838	CERAMIC CHIP	0.01UF+-20% 50V
C 248	0201015	CERAMIC CHIP	5PF+-0.25PF 50V
C 251	0209896	CERAMIC CHIP	47PF+-5% 50V
C 253	0201018	CERAMIC CHIP	8PF+-5% 50V
C 254	0209855	CERAMIC CHIP	0.022UF+-20% 25V
C 256	0209840	CERAMIC CHIP	220PF+-10% 50V
C 262	0201088	CERAMIC DISC	10PF +-0.5PF
C 263	0209852	CERAMIC CHIP	180PF+-5% 50V
C 264	0209876	CERAMIC CHIP	6PF+-10% 50V
C 265	0209903	CERAMIC CHIP	470PF+-5% 50V
C 272	0209855	CERAMIC CHIP	0.022UF+-20% 25V
C 273	0201055	CERAMIC CHIP	1000PF+-20% 25V
C 274	0209855	CERAMIC CHIP	0.022UF+-20% 25V
C 276	0209855	CERAMIC CHIP	0.022UF+-20% 25V
C 277	0209855	CERAMIC CHIP	0.022UF+-20% 25V
C 278	0209898	CERAMIC CHIP	100PF+-5% 50V
C 412	0890044	CERAMIC DISC	0.022UF+80-20% 25V
C 414	0890044	CERAMIC DISC	0.022UF+80-20% 25V
C 417	0890043	CERAMIC DISC	0.01UF+-20% 16V
C 420	0890026	CERAMIC DISC	220PF+-10% 50V
C 480	0890018	CERAMIC DISC	56PF+-50% 50V
C 612	0890035	CERAMIC DISC	1000PF+-10% 50V
C 619	0890022	CERAMIC DISC	100PF+-10% 50V
C 621	0890022	CERAMIC DISC	100PF+-10% 50V
C 623	0890022	CERAMIC DISC	100PF+-10% 50V
C 628	0890035	CERAMIC DISC	1000PF+-10% 50V
C 629	0890035	CERAMIC DISC	1000PF+-10% 50V
C 630	0239367	CERAMIC DISC	1000PF+-10% 50V
C 633	0890035	CERAMIC DISC	1000PF+-10% 50V
C 702	0890043	CERAMIC DISC	0.01UF+-20% 16V
C 704	0890045	CERAMIC DISC	0.047UF+80-20% 50V
C 705	0890043	CERAMIC DISC	0.01UF+-20% 16V
C 708	0208448	CERAMIC DISC	22PF+-5% 50V
C 709	0208448	CERAMIC DISC	22PF+-5% 50V
C 710	0890043	CERAMIC DISC	0.01UF+-20% 16V
C 809	0890043	CERAMIC DISC	0.01UF+-20% 16V
C 810	0890043	CERAMIC DISC	0.01UF+-20% 16V
C 820	0890043	CERAMIC DISC	0.01UF+-20% 16V
C 822	0890022	CERAMIC DISC	100PF+-10% 50V
C 876	0256787	ELECTROLYTIC	4700UF 25V
C 880	0256861	ELECTROLYTIC	2200UF 16V
C 902	0890043	CERAMIC DISC	0.01UF+-20% 16V
C 903	0890022	CERAMIC DISC	100PF+-10% 50V
C 904	0890022	CERAMIC DISC	100PF+-10% 50V
C 907	0890044	CERAMIC DISC	0.022UF+80-20% 25V
C 908	0890043	CERAMIC DISC	0.01UF+-20% 16V
C 909	0890043	CERAMIC DISC	0.01UF+-20% 16V
C 910	0890043	CERAMIC DISC	0.01UF+-20% 16V
C 914	0890044	CERAMIC DISC	0.022UF+80-20% 25V
C 921	0890043	CERAMIC DISC	0.01UF+-20% 16V
C 922	0890043	CERAMIC DISC	0.01UF+-20% 16V
C 923	0890043	CERAMIC DISC	0.01UF+-20% 16V
C 924	0890045	CERAMIC DISC	0.047UF+80-20% 50V
C1308	0209855	CERAMIC CHIP	0.022UF+-20% 25V
C1517	0890044	CERAMIC DISC	0.022UF+80-20% 25V
C1522	0890043	CERAMIC DISC	0.01UF+-20% 16V
C1524	0890044	CERAMIC DISC	0.022UF+80-20% 25V
C1537	0890044	CERAMIC DISC	0.022UF+80-20% 25V
C1544	0890018	CERAMIC DISC	56PF+-50% 50V
C1550	0890043	CERAMIC DISC	0.01UF+-20% 16V
C1592	0890044	CERAMIC DISC	0.022UF+80-20% 25V
C2502	0890043	CERAMIC DISC	0.01UF+-20% 16V
C2516	0890035	CERAMIC DISC	1000PF+-10% 50V
C2517	0890035	CERAMIC DISC	1000PF+-10% 50V
C2518	0890044	CERAMIC DISC	0.022UF+80-20% 25V
C2530	0890044	CERAMIC DISC	0.022UF+80-20% 25V
C2532	0890044	CERAMIC DISC	0.022UF+80-20% 25V
C2535	0239354	CERAMIC DISC	33PF+-5% 50V
C2536	0890044	CERAMIC DISC	0.022UF+80-20% 25V
C2550	0890044	CERAMIC DISC	0.022UF+80-20% 25V
C2553	0890044	CERAMIC DISC	0.022UF+80-20% 25V
C3502	0890043	CERAMIC DISC	0.01UF+-20% 16V
C3504	0890043	CERAMIC DISC	0.01UF+-20% 16V
C3506	0890043	CERAMIC DISC	0.01UF+-20% 16V
C3508	0890043	CERAMIC DISC	0.01UF+-20% 16V
C3511	0890043	CERAMIC DISC	0.01UF+-20% 16V

RESISTORS

SYMBOL-NO	P-NO	DESCRIPTION	
R 201	0103834	CHIP RESISTOR	180OHM+-5% 0.1W
R 202	0103851	CHIP RESISTOR	4.7KOHM+-5% 0.1W
R 203	0103848	CHIP RESISTOR	2.7KOHM+-5% 0.1W
R 204	0103841	CHIP RESISTOR	680OHM+-5% 0.1W
R 205	0103839	CHIP RESISTOR	470OHM+-5% 0.1W
R 206	0103836	CHIP RESISTOR	270OHM+-5% 0.1W
R 207	0103843	CHIP RESISTOR	1KOHM+-5% 0.1W
R 209	0103843	CHIP RESISTOR	1KOHM+-5% 0.1W
R 210	0103843	CHIP RESISTOR	1KOHM+-5% 0.1W
R 217	0103845	CHIP RESISTOR	1.5KOHM+-5% 0.1W
R 218	0103851	CHIP RESISTOR	4.7KOHM+-5% 0.1W
R 219	0103848	CHIP RESISTOR	2.7KOHM+-5% 0.1W
R 220	0103843	CHIP RESISTOR	1KOHM+-5% 0.1W
R 222	0103843	CHIP RESISTOR	1KOHM+-5% 0.1W
R 223	0103836	CHIP RESISTOR	270OHM+-5% 0.1W
R 226	0103842	CHIP RESISTOR	820OHM+-5% 0.1W
R 227	0103843	CHIP RESISTOR	1KOHM+-5% 0.1W
R 228	0103859	CHIP RESISTOR	22KOHM+-5% 0.1W
R 230	0103844	CHIP RESISTOR	1.2KOHM+-5% 0.1W
R 231	0103845	CHIP RESISTOR	1.5KOHM+-5% 0.1W
R 234	0103855	CHIP RESISTOR	10KOHM+-5% 0.1W
R 242	0103841	CHIP RESISTOR	680OHM+-5% 0.1W
R 243	0103843	CHIP RESISTOR	1KOHM+-5% 0.1W
R 244	0103843	CHIP RESISTOR	1KOHM+-5% 0.1W
R 246	0103837	CHIP RESISTOR	330OHM+-5% 0.1W
R 248	0103843	CHIP RESISTOR	1KOHM+-5% 0.1W
R 251	0103838	CHIP RESISTOR	390OHM+-5% 0.1W
R 254	0103844	CHIP RESISTOR	1.2KOHM+-5% 0.1W
R 255	0103857	CHIP RESISTOR	15KOHM+-5% 0.1W
R 256	0103861	CHIP RESISTOR	33KOHM+-5% 0.1W
R 257	0103843	CHIP RESISTOR	1KOHM+-5% 0.1W
R 258	0103843	CHIP RESISTOR	1KOHM+-5% 0.1W
R 259	0103837	CHIP RESISTOR	330OHM+-5% 0.1W
R 260	0103843	CHIP RESISTOR	1KOHM+-5% 0.1W
R 263	0103852	CHIP RESISTOR	5.6KOHM+-5% 0.1W

SYMBOL-NO	P-NO	DESCRIPTION
R 264	0103855	CHIP RESISTOR 10KOHM+-5% 0.1W
R 265	0103843	CHIP RESISTOR 1KOHM+-5% 0.1W
R 266	0103843	CHIP RESISTOR 1KOHM+-5% 0.1W
R 860	0170481	FUSE RESISTOR 22OHM+-5% 1/4W
RT 201	5007712	SEMI VARIABLE 1KOHM
RT 203	5007714	SEMI VARIABLE 4.7KOHM
RT 401	5030011	SEMI VARIABLE 100KOHM
RT 402	5030009	SEMI VARIABLE 47KOHM
RT 605	5030013	SEMI VARIABLE 470KOHM
RT 606	5030008	SEMI VARIABLE 22KOHM
RT 621	5030013	SEMI VARIABLE 470KOHM
RT 623	5030012	SEMI VARIABLE 220KOHM
RT 801	5007461	SEMI VARIABLE 4.7KOHM
RT1301	5007711	SEMI VARIABLE 470OHM
RT1501	5009142	VARIABLE 50KOHM
		SEMI-CONDUCTORS
D 141	5380933	LED GL-451
D 201	5328301	DIODE MA151WK(MT)
D 203	5339131	DIODE 1SS254
D 207	5328321	DIODE MA151K (MH)
D 401	5339131	DIODE 1SS254
D 601	5339131	DIODE 1SS254
D 604	5339131	DIODE 1SS254
D 605	5339131	DIODE 1SS254
D 606	5339131	DIODE 1SS254
D 703	5339131	DIODE 1SS254
D 704	5339131	DIODE 1SS254
D 705	5339131	DIODE 1SS254
D 706	5339131	DIODE 1SS254
D 707	5339131	DIODE 1SS254
D 708	5339131	DIODE 1SS254
D 709	5339131	DIODE 1SS254
D 710	5339131	DIODE 1SS254
D 711	5339131	DIODE 1SS254
D 712	5339131	DIODE 1SS254
D 714	5339131	DIODE 1SS254
D 715	5339131	DIODE 1SS254
D 726	5339131	DIODE 1SS254
D 728	5339131	DIODE 1SS254
D 729	5339131	DIODE 1SS254
D 751	5381214	LED SEL2413E
D 801	5339131	DIODE 1SS254
D 802	5339131	DIODE 1SS254
D 803	5339131	DIODE 1SS254
D 805	5339231	DIODE 1SR35-100A
⚠ D 851	5333282	DIODE RBA-402
D 854	5339131	DIODE 1SS254
D 855	5339131	DIODE 1SS254
D 856	5339231	DIODE 1SR35-100A
D 857	5339231	DIODE 1SR35-100A
⚠ D 861	5339231	DIODE 1SR35-100A
⚠ D 862	5339231	DIODE 1SR35-100A
⚠ D 863	5339231	DIODE 1SR35-100A
⚠ D 864	5339231	DIODE 1SR35-100A
D 901	5339131	DIODE 1SS254
D 902	5339131	DIODE 1SS254
D 903	5339131	DIODE 1SS254
D 904	5339131	DIODE 1SS254
D 905	5339131	DIODE 1SS254
D 907	5339171	DIODE 1SS130
D 908	5339171	DIODE 1SS130
D 911	5339131	DIODE 1SS254
D1501	5339131	DIODE 1SS254
D1503	5339131	DIODE 1SS254

SYMBOL-NO	P-NO	DESCRIPTION
D1505	5339131	DIODE 1SS254
D1506	5339131	DIODE 1SS254
D1508	5339131	DIODE 1SS254
D1512	5339131	DIODE 1SS254
D1513	5339131	DIODE 1SS254
D1514	5339131	DIODE 1SS254
D1516	5339231	DIODE 1SR35-100A
D1517	5339231	DIODE 1SR35-100A
D1519	5332541	DIODE ERA81-004P
D1520	5332541	DIODE ERA81-004P
D1602	5339131	DIODE 1SS254
D1603	5339131	DIODE 1SS254
D1605	5339131	DIODE 1SS254
D2501	5339131	DIODE 1SS254
D2502	5339131	DIODE 1SS254
D2510	5339131	DIODE 1SS254
D2511	5339131	DIODE 1SS254
D2512	5339131	DIODE 1SS254
D2520	5339131	DIODE 1SS254
D2521	5339131	DIODE 1SS254
D2522	5339131	DIODE 1SS254
D2524	5339131	DIODE 1SS254
D2525	5339131	DIODE 1SS254
D2526	5339131	DIODE 1SS254
D2532	5339131	DIODE 1SS254
D2533	5339131	DIODE 1SS254
IC 141	5391282	IC DN6851
IC 142	5391282	IC DN6851
IC 201	1370445	MODULE HT4937D
IC 204	1388114	PWB ASSY (CHOROMA PROCESS)
IC 205	1380212	PWB ASSY (SECAM DET)
IC 206	1370731	MODULE HN7147
IC 401	1341471	IC LA7295
IC 601	1342162	IC BU2749S
IC 602	1341421	IC LA7116
IC 603	5350607	IC RC4558
IC 701	5302769	IC M50957-680SP
IC 702	5301561	IC M6M80021P
IC 703	5361942	IC S-8053ALB
IC 801	5367201	IC UPC1484CA
IC 802	5364301	IC NJM78M05A
IC 803	5721941	IC PROTECTOR
IC 851	5300452	IC STK5372H
IC 901	1345153	IC HD4074019
IC 902	5300794	IC BA6209U4
IC 903	1387951	PWB ASSY (TAPE ENDDET)
IC 904	1340111	IC PST524
IC 905	5721941	IC PROTECTOR
IC1502	1342031	IC NJM2248S
IC1503	5369431	IC LA7016
IC1510	1380472	IC PLT-623-0009
IC1511	1387912	PWB ASSY HES8052A(VPS MODEL ONLY)
IC1601	5300821	IC M54874P
IC1651	1341941	IC LB1684H
IC2503	5366981	IC M5201L
Q 141	5324661	TRANSISTOR PT-483F1
Q 142	5324661	TRANSISTOR PT-483F1
Q 201	5328971	TRANSISTOR 2SC2412KBRST
Q 202	5328331	TRANSISTOR 2SB709A(AR)
Q 204	5328971	TRANSISTOR 2SC2412KBRST
Q 205	5328971	TRANSISTOR 2SC2412KBRST
Q 206	5328971	TRANSISTOR 2SC2412KBRST
Q 209	5328971	TRANSISTOR 2SC2412KBRST
Q 210	5328331	TRANSISTOR 2S709AR
Q 211	5328971	TRANSISTOR 2SC2412KBRST

SYMBOL-NO	P-NO	DESCRIPTION
Q 401	5327101	TRANSISTER 2SC3553BC
Q 601	5327031	TRANSISTOR 2SA673C
Q 614	5327063	TRANSISTOR 2SC1740(S,RS)
Q 621	5324861	TRANSISTOR 2SD2061
Q 622	5327063	TRANSISTOR 2SC1740(S,RS)
Q 623	5324861	TRANSISTOR 2SD2061
Q 624	5327063	TRANSISTOR 2SC1740(S,RS)
Q 901	5327091	TRANSISTER 2SD1504E
Q 902	5327031	TRANSISTOR 2SA673C
QR 201	5328793	TRANSISTOR DTC144K-26
QR 202	5323793	TRANSISTOR DTC144K-26
QR 205	5327082	TRANSISTOR RT1N441S
QR 207	5328793	TRANSISTOR DTC144K-26
QR 211	5327074	TRANSISTOR DTA144ES
QR 212	5327073	TRANSISTOR DTC144ES
QR 602	5327073	TRANSISTOR DTC144ES
QR 603	5327073	TRANSISTOR DTC144ES
QR 604	5327073	TRANSISTOR DTC144ES
QR 615	5327073	TRANSISTOR DTC144ES
QR 616	5327073	TRANSISTOR DTC144ES
QR 801	5327073	TRANSISTOR DTC144ES
QR 901	5327073	TRANSISTOR DTC144ES
QR 902	5327073	TRANSISTOR DTC144ES
QR 903	5327073	TRANSISTOR DTC144ES
QR1301	5328791	TRANSISTOR DTC124K(25)
QR1501	5327074	TRANSISTOR DTA144ES-T
QR1502	5327073	TRANSISTOR DTC144ES
QR2501	5327082	TRANSISTOR RT1N441S
QR2502	5327073	TRANSISTOR DTC144ES
QR2503	5327073	TRANSISTOR DTC144ES
QR2504	5327073	TRANSISTOR DTC144ES
QR2510	5327073	TRANSISTOR DTC144ES
Q1510	5327062	TRANSISTOR 2SC1740SR(S.R)
Q1512	5327021	TRANSISTOR 2SA844CD-TB
Q1530	1320012	TRANSISTOR 2SA933 (S.R)
Q1532	5327062	TRANSISTOR 2SC1740SR(S.R)
Q1580	5327062	TRANSISTOR 2SC1740SR(S.R)
Q1581	5327062	TRANSISTOR 2SC1740SR(S.R)
Q1595	5327062	TRANSISTOR 2SC1740SR(S.R)
Q1596	5323904	TRANSISTOR 2SC1740S
Q2501	5327021	TRANSISTOR 2SA844CD-TB
Q2502	5327151	TRANSISTOR 2SA952-ML2
Q2510	5327001	TRANSISTOR 2SC458CD
Q2511	5327001	TRANSISTOR 2SC458CD
Q2512	5327021	TRANSISTOR 2SA844CD-TB
Q3501	5324222	TRANSISTOR 2SA933(S)
ZD 601	5339255	ZENER DIODE HZS12-C3T
ZD 602	5339274	ZENER DIODE HZS15-3
ZD 701	5339265	ZENER DIODE HZS9-B3
ZD 702	5339151	ZENER DIODE RD2.7E-B2
ZD 802	5339256	ZENER DIODE HZS30
ZD 803	5339252	ZENER DIODE HZS5-C2
ZD 804	5339252	ZENER DIODE HZS5-C2
ZD 901	5339271	ZENER DIODE HZS9A2
ZD 902	5339262	ZENER DIODE HZS6-C2
ZD 903	5339262	ZENER DIODE HZS6-C2
ZD 904	5339256	ZENER DIODE HZS30

TRANSFORMERS

SYMBOL-NO	P-NO	DESCRIPTION
T 401	5262532	BIAS COIL

COILS

SYMBOL-NO	P-NO	DESCRIPTION	
L 201	5153037	CHOKE COIL	33UH+-5%
L 202	5121178	CHOKE COIL	39UH+-10%
L 203	5159077	CHOKE COIL	100UH+-10%
L 204	5159149	CHOKE COIL	47UH
L 205	5159077	CHOKE COIL	100UH+-10%
L 207	5159068	CHOKE COIL	22UH+-10%
L 209	5159066	CHOKE COIL	15UH+-10%
L 211	5159074	CHOKE COIL	56UH+-10%
L 212	5159077	CHOKE COIL	100UH+-10%
L 213	5159076	CHOKE COIL	82UH
L 216	5159141	CHOKE COIL	10UH
L 217	5153041	CHOKE COIL	56UH
L 219	5159079	CHOKE COIL	150UH+-10%
L 220	5159079	CHOKE COIL	150UH+-10%
L 221	5159077	CHOKE COIL	100UH+-10%
L 222	5159077	CHOKE COIL	100UH+-10%
L 223	5159077	CHOKE COIL	100UH+-10%
L 224	5159076	CHOKE COIL	82UH
L 225	5159089	CHOKE COIL	820UH+-10%
L 401	5159113	CHOKE COIL	8.2UH
L 402	5159081	CHOKE COIL	180UH
L 403	5159111	CHOKE COIL	5600UH
L 404	5159081	CHOKE COIL	180UH
L 901	5159077	CHOKE COIL	100UH+-10%
L 903	5159077	CHOKE COIL	100UH+-10%
L1501	5159077	CHOKE COIL	100UH+-10%
L1502	5159077	CHOKE COIL	100UH+-10%
L1520	5159068	CHOKE COIL	22UH+-10%
L1530	5159077	CHOKE COIL	100UH+-10%
L1591	5159077	CHOKE COIL	100UH+-10%
L2501	5159077	CHOKE COIL	100UH+-10%
L2502	5159154	CHOKE COIL	100UH
L2510	5159071	CHOKE COIL	33UH+-10%
L2511	5159077	CHOKE COIL	100UH+-10%
L2512	5159077	CHOKE COIL	100UH+-10%
L2520	5159077	CHOKE COIL	100UH+-10%
⚠ LF851	5272292	FILTER	
⚠ LF852	5272292	FILTER	

CRYSTALS

SYMBOL-NO	P-NO	DESCRIPTION
X 701	5784473	CRYSTAL
X 702	5783001	CRYSTAL

MISCELLANEOUS

SYMBOL-NO	P-NO	DESCRIPTION
BL2501	5272372	CORE
BL2502	5272372	CORE
BL2503	5272372	CORE
BL2504	5272372	CORE
BZ 701	5400071	BUZZER
CE 901	5784471	OSCILLATOR
CP 201	5163685	LC FILTER
CP 203	5163553	LC FILTER
CP 204	5163684	LC FILTER
CP 205	5163805	LC FILTER
CP 207	5785388	DELAY LINE
CP 208	5163891	LC FILTER
CP1501	5163204	COIL
DG 701	5315151	ELUORESCENT INDICATOR TUBE
⚠ F 850	5720174	FUSE 630MA
⚠ F 851	5721061	FUSE 1.6A
⚠ F 852	5720175	FUSE 0.8A
IR 701	5317191	MODULE,INF
J2502	5672973	PLATE,JACK
S 141	5635321	SWITCH
S 142	5635331	SWITCH
S 703	5635061	SWITCH
S 704	5635061	SWITCH
S 705	5635061	SWITCH
S 709	5635061	SWITCH

MECHANICAL PARTS LIST (LISTE DER MECHANISCHEN TEILE) -VT-M63XE-

SYMBOL-NO	P-NO	DESCRIPTION
S 710	5635061	SWITCH
S 711	5635061	SWITCH
S 712	5635061	SWITCH
S 713	5635061	SWITCH
S 714	5635061	SWITCH
S 715	5635061	SWITCH
S 716	5635061	SWITCH
S 717	5635061	SWITCH
S 718	5635061	SWITCH
S 719	5635061	SWITCH
S1501	5622462	SLIDE SWITCH
S1504	5622462	SLIDE SWITCH

SYMBOL-NO	P-NO	DESCRIPTION
		FOR FINAL ASSEMBLY
101	6231138	DOOR,CASSETTE
102	7741444	FELT (LEG)
103	6003315	COVER,BOTTOM
104	6004184	COVER,TOP
105	6483463	PANEL,FRONT (M630E ONLY)
105	6483467	PANEL,FRONT (M635E ONLY)
105	6483466	PANEL,FRONT (M636E ONLY)
106	6072211	BUTTON,PE
107	6483051	PANEL,REAR
108	7792395	HOLDER,TRANS
109	6808961	HOLDER,PWB
110	6800971	STUD
111	7495671	PLATE
112	6407471	COVER,FUSE
113	5885991	PLUG CABLE
114	6794591	BUSHING
⚠ 115	5850791	CORD,POWER
116	7700872	SHEET,PROTECT
117	6714216	NYLON RIVET
⚠ 118	5214181	TRANSFORMER,POWER
119	6229391	PIECE,REAR
121	5588491	TUNER IF BLOCK
122	5589251	CONVERTER,RF (M630E ONLY)
122	5589252	CONVERTER,RF (M635E /M636E ONLY)
123	6808821	HOLDER.DIG
124	6071411	BUTTON
125	6071421	BUTTON
126	5722214	FUSE HOLDER
127	6484354	DOOR.CONTROL (M630E ONLY)
127	6484355	DOOR.CONTROL (M635E ONLY)
127	6484375	DOOR.CONTROL (M636E ONLY)
130	7494501	PLATE,SHIELD
202	6911101	SCREW
203	7412852	BASE-ACE HEAD
204	5446631	HEAD-AUDIO CONTROL
205	6304906	SPRING
206	6522752	SPRING
207	7785673	NUT
208	6896914	HOLDER
209	6555501	SPRING
210	6415532	REEL,SUPPLY
211	7789123	POLYSLIDER WASHER
212	6415542	REEL-TAKE UP
213	7789122	POLYSLIDER WASHER
214	6975766	ARM,PRESSER ROLLER
215	6804273	BLOCK,SLIDER
216	7412822	PLATE
217	7412816	GEAR,LOADING (L)
218	7412806	GEAR,LOADING (R)
219	6911551	GUIDE ROLLER BASE(IN)
220	6344741	GUIDE ROLLER
221	69115723	BRACKET
222	6911002	BASE,CYLINDER
223	5445851	HEAD FULL ERASE
224	6897473	ARM,IMPEDANCE
225	4508237	GUIDE,TAPE
226	6555431	SPRING
227	7413665	HOLDER-BAND
228	7412863	ARM
229	6555444	SPRING
230	6897264	HOLDER
231	6896751	ARM
232	6555061	SPRING

SYMBOL-NO	P-NO	DESCRIPTION
233	6976371	ARM
234	6898472	ARM,IDLE
235	7429674	LOAD BLOCK
236	7398631	BRACKET
237	7412881	ARM
238	6976551	ARM
239	7412892	ARM
240	7428072	ARM,OPERATION
241	6897241	ARM
242	6551151	SPRING
243	6804791	BRAKE
244	6896894	HOLDER,MOTOR
245	6896852	ARM
246	6897251	ARM
247	6555483	SPRING
248	6897271	ARM
249	6897065	GEAR,MODE
250	6434861	WORM WHEEL
251	6555052	SPRING
252	7799012	WASHER
253	7786623	POLYSLIDER WASHER
254	4508235	GUIDE
261	7078391	PWB ASSY PRE/REC AMP
301	5571471	MOTOR,CAPSTAN
302	6896951	CULUTCH BASE ASSY
303	6351555	BELT
304	6897095	ARM,FF/REW
305	6434851	RACK
402	7412574	BRACKET,SIDE(R)
403	6896685	BRACKET,SIDE(R)
404	6896971	WORM WHEEL ASSY
405	6435571	WORM
406	4508221	WORM SHAFT
407	6896632	ARM-SWITCH
408	6897041	ARM-SWITCH
409	6302474	SPRING
410	6896623	ARM,DOOR
411	7412583	BRACKET-GEAR
412	7449171	HOLDER,CASSETTE
413	7449161	BASE,CASSETTE HOLDER
414	6896664	HOLDER,CASSETTE (R)
415	7428113	HOLDER,STAY
416	6806641	ARM
417	6897001	ARM
418	6555043	SPRING
419	6896673	HOLDER,CASSETTE (L)
420	7412944	ARM
421	6555771	SPRING
422	7412952	SPRING
423	6806521	HOLDER,FRONT
424	7580791	SHAFT ASSY
425	7412551	BRACKET-SIDE (L)
426	6323724	SPRING
427	7794391	WASHER
501	5457478	UPPER CYLINDER (CY-Z3P)
503	5792633	BRUSH
901	8699412	SCREW (3X12) BLACK
902	7784428	SCREW (M3)
903	8699410	SCREW(3X10)
904	8691412	SCREW (3X12)
905	8691412	SCREW (3X12)
906	7785351	SCREW (4X14)
951	8691410	SCREW
952	86913103	SCREW
953	8699408	SCREW

SYMBOL-NO	P-NO	DESCRIPTION
954	7781872	SCREW-3MMDX8MM
955	7773086	SCREW
956	8741414	SCREW (3X14)
957	8691412	SCREW (3X12)
958	8691408	SCREW (3X8)
959	8741408	SCREW (B3X8)
960	8741412	SCREW (B3X12)
961	7785941	SCREW
963	87114043	SCREW - 3X4 PAN HEAD SCREW
		FOR ACCESSARIES
	5858311	CONNECTION CODE
	5614193	REMOTE HAND SET
		FOR REMOTE CONTROLLER UNIT
1	5614061	COVER
2	5614283	CASE.UPPER (M630E ONLY)
2		CASE.UPPER (M640E ONLY)
3	5614062	PLATE.CLEAR
4	5614063	CASE.BOTTOM
5	5614066	CASE.BATTERY

REPLACEMENT PARTS LIST(ERSATZTEILLISTE)

ELECTRICAL PARTS LIST(LISTE DER ELEKTRISCHEN TEILE)

SYMBOL-NO	P-NO	DESCRIPTION
		CAPACITORS
C 202	0209855	CERAMIC CHIP 0.022UF+-20% 25V
C 205	0209838	CERAMIC CHIP 0.01UF+-20% 50V
C 206	0201024	CERAMIC CHIP 27PF+-5% 50V
C 209	0201029	CERAMIC CHIP 68PF+-10% 50V
C 211	0201024	CERAMIC CHIP 27PF+-10% 50V
C 217	0209834	CERAMIC DISC 470PF+-10% 12V
C 218	0209855	CERAMIC CHIP 0.022UF+-20% 25V
C 222	0209894	CERAMIC CHIP 27PF+-10% 50V
C 233	0201007	CERAMIC CHIP 0.01UF+-20% 50V
C 234	0209893	CERAMIC CHIP 22PF+-10% 50V
C 235	0201028	CERAMIC CHIP 56PF+-10% 50V
C 238	0209838	CERAMIC CHIP 0.01UF+-20% 50V
C 239	0209838	CERAMIC CHIP 0.01UF+-20% 50V
C 241	0209838	CERAMIC CHIP 0.01UF+-20% 50V
C 242	0209894	CERAMIC CHIP 27PF+-10% 50V
C 243	0209855	CERAMIC CHIP 0.022UF+-20% 25V
C 247	0209838	CERAMIC CHIP 0.01UF+-20% 50V
C 248	0201015	CERAMIC CHIP 5PF+-0.25PF 50V
C 251	0209896	CERAMIC CHIP 47PF+-5% 50V
C 253	0101018	CERAMIC CHIP 8PF+-10% 50V
C 254	0209855	CERAMIC CHIP 0.022UF+-20% 25V
C 260	0201001	CERAMIC CHIP 22PF+-5% 50V
C 261	0201023	CERAMIC CHIP 18PF+-10% 50V
C 262	0201088	CERAMIC CHIP 10PF+-0.5PF
C 263	0209852	CERAMIC CHIP 180PF+-5% 50V
C 264	0209876	CERAMIC CHIP 6PF+-10% 50V
C 265	0209903	CERAMIC CHIP 470PF+-5% 50V
C 272	0209855	CERAMIC CHIP 0.022UF+-20% 25V
C 273	0201055	CERAMIC CHIP 1000PF+-20% 25V
C 274	0209855	CERAMIC CHIP 0.022UF+-20% 25V
C 276	0209855	CERAMIC CHIP 0.022UF+-20% 25V
C 277	0209855	CERAMIC CHIP 0.022UF+-20% 25V
C 278	0209898	CERAMIC CHIP 100PF+-5% 50V
C 412	0890044	CERAMIC DISC 0.022UF+80-20% 25V
C 414	0890044	CERAMIC DISC 0.022UF+80-20% 25V
C 417	0890043	CERAMIC DISC 0.01UF+-20% 16V
C 420	0890026	CERAMIC DISC 220PF+-10% 50V
C 425	0890103	CERAMIC DISC 47000PF+80-20% 12V
C 480	0890018	CERAMIC DISC 56PF+-50% 50V
C 601	0890044	CERAMIC DISC 0.022UF+80-20% 25V
C 612	0890035	CERAMIC DISC 1000PF+-10% 50V
C 619	0890022	CERAMIC DISC 100PF+-10% 50V
C 621	0890022	CERAMIC DISC 100PF+-10% 50V
C 623	0890022	CERAMIC DISC 100PF+-10% 50V
C 628	0890035	CERAMIC DISC 1000PF+-10% 50V
C 629	0890035	CERAMIC DISC 1000PF+-10% 50V
C 633	0890035	CERAMIC DISC 1000PF+-10% 50V
C 651	0890044	CERAMIC DISC 0.022UF+80-20% 25V
C 653	0890044	CERAMIC DISC 0.022UF+80-20% 25V
C 702	0890043	CERAMIC DISC 0.01UF+-20% 16V
C 703	0256160	ELECTROLYTIC 47UF 6.3V
C 704	0890045	CERAMIC DISC 0.047UF+80-20% 50V
C 705	0890043	CERAMIC DISC 0.01UF+-20% 16V
C 710	0890043	CERAMIC DISC 0.01UF+-20% 16V
C 711	0256160	ELECTROLYTIC 47UF 6.3V
C 715	0256160	ELECTROLYTIC 47UF 6.3V
C 809	0890043	CERAMIC DISC 0.01UF+-20% 16V
C 810	0890043	CERAMIC DISC 0.01UF+-20% 16V
C 820	0890043	CERAMIC DISC 0.01UF+-20% 16V
C 822	0890022	CERAMIC DISC 100PF+-10% 50V
C 876	0256787	ELECTROLYTIC 4700UF 25V
C 880	0256861	ELECTROLYTIC 2200UF 16V
C 902	0890043	CERAMIC DISC 0.01UF+-20% 16V
C 903	0890022	CERAMIC DISC 100PF+-10% 50V
C 904	0890022	CERAMIC DISC 100PF+-10% 50V
C 907	0890044	CERAMIC DISC 0.022UF+80-20% 25V
C 908	0890043	CERAMIC DISC 0.01UF+-20% 16V
C 909	0890043	CERAMIC DISC 0.01UF+-20% 16V
C 910	0890043	CERAMIC DISC 0.01UF+-20% 16V
C 914	0890044	CERAMIC DISC 0.022UF+80-20% 25V
C 921	0890043	CERAMIC DISC 0.01UF+-20% 16V
C 922	0890043	CERAMIC DISC 0.01UF+-20% 16V
C 923	0890043	CERAMIC DISC 0.01UF+-20% 16V
C 924	0890045	CERAMIC DISC 0.047UF+80-20% 50V
C1308	0209855	CERAMIC CHIP 0.022UF+-20% 25V
C1517	0890044	CERAMIC DISC 0.022UF+80-20% 25V
C1522	0890043	CERAMIC DISC 0.01UF+-20% 16V
C1524	0890044	CERAMIC DISC 0.022UF+80-20% 25V
C1527	0890044	CERAMIC DISC 0.022UF+80-20% 25V
C1544	0890018	CERAMIC DISC 56PF+-50% 50V
C1550	0890043	CERAMIC DISC 0.01UF+-20% 16V
C1592	0890044	CERAMIC DISC 0.022UF+80-20% 25V
C2502	0890043	CERAMIC DISC 0.01UF+-20% 16V
C2516	0890035	CERAMIC DISC 1000PF+-10% 50V
C2517	0890035	CERAMIC DISC 1000PF+-10% 50V
C2518	0890044	CERAMIC DISC 0.022UF+80-20% 25V
C2530	0890044	CERAMIC DISC 0.022UF+80-20% 25V
C2532	0890044	CERAMIC DISC 0.022UF+80-20% 25V
C2535	0239354	CERAMIC DISC 33PF+-5% 50V
C2536	0890044	CERAMIC DISC 0.022UF+80-20% 25V
C2550	0890044	CERAMIC DISC 0.022UF+80-20% 25V
C2553	0890044	CERAMIC DISC 0.022UF+80-20% 25V
C3502	0890043	CERAMIC DISC 0.01UF+-20% 16V
C3504	0890043	CERAMIC DISC 0.01UF+-20% 16V
C3506	0890043	CERAMIC DISC 0.01UF+-20% 16V
C3508	0890043	CERAMIC DISC 0.01UF+-20% 16V
C3511	0890043	CERAMIC DISC 0.01UF+-20% 16V
		RESISTORS
R 201	0103834	CHIP RESISTOR 180 OHM+-5% 0.1W
R 202	0103851	CHIP RESISTOR 4.7KOHM+-5% 0.1W
R 203	0103848	CHIP RESISTOR 2.7KOHM+-5% 0.1W
R 204	0103841	CHIP RESISTOR 680 OHM+-5% 0.1W
R 205	0103839	CHIP RESISTOR 470 OHM+-5% 0.1W
R 206	0103836	CHIP RESISTOR 270 OHM+-5% 0.1W
R 207	0103843	CHIP RESISTOR 1KOHM+-5% 0.1W
R 208	0103855	CHIP RESISTOR 10KOHM+-5% 0.1W
R 209	0103843	CHIP RESISTOR 1KOHM+-5% 0.1W
R 210	0103843	CHIP RESISTOR 1KOHM+-5% 0.1W
R 217	0103845	CHIP RESISTOR 1.5KOHM+-5% 0.1W
R 218	0103851	CHIP RESISTOR 4.7KOHM+-5% 0.1W
R 219	0103848	CHIP RESISTOR 2.7KOHM+-5% 0.1W
R 220	0103843	CHIP RESISTOR 1KOHM+-5% 0.1W
R 222	0103843	CHIP RESISTOR 1KOHM+-5% 0.1W
R 223	0103836	CHIP RESISTOR 270 OHM+-5% 0.1W
R 226	0103842	CHIP RESISTOR 820 OHM+-5% 0.1W
R 227	0103843	CHIP RESISTOR 1KOHM+-5% 0.1W
R 228	0103859	CHIP RESISTOR 22KOHM+-5% 0.1W
R 230	0103844	CHIP RESISTOR 1.2KOHM+-5% 0.1W
R 231	0103845	CHIP RESISTOR 1.5KOHM+-5% 0.1W
R 234	0103855	CHIP RESISTOR 10KOHM+-5% 0.1W
R 242	0103841	CHIP RESISTOR 680 OHM+-5% 0.1W
R 243	0103843	CHIP RESISTOR 1KOHM+-5% 0.1W
R 244	0103843	CHIP RESISTOR 1KOHM+-5% 0.1W
R 246	0103837	CHIP RESISTOR 330 OHM+-5% 0.1W
R 248	0103843	CHIP RESISTOR 1KOHM+-5% 0.1W
R 251	0103838	CHIP RESISTOR 390 OHM+-5% 0.1W
R 252	0103849	CHIP RESISTOR 3.3KOHM+-5% 0.1W
R 254	0103844	CHIP RESISTOR 1.2KOHM+-5% 0.1W

SYMBOL-NO	P-NO	DESCRIPTION
R 255	0103857	CHIP RESISTOR 15KOHM+-5% 0.1W
R 256	0103861	CHIP RESISTOR 33KOHM+-5% 0.1W
R 257	0103843	CHIP RESISTOR 1KOHM+-5% 0.1W
R 258	0103843	CHIP RESISTOR 1KOHM+-5% 0.1W
R 259	0103837	CHIP RESISTOR 330OHM+-5% 0.1W
R 260	0103843	CHIP RESISTOR 1KOHM+-5% 0.1W
R 263	0103852	CHIP RESISTOR 5.6KOHM+-5% 0.1W
R 264	0103855	CHIP RESISTOR 10KOHM+-5% 0.1W
R 265	0103843	CHIP RESISTOR 1KOHM+-5% 0.1W
R 266	0103843	CHIP RESISTOR 1KOHM+-5% 0.1W
R 608	0171276	METAL FILM 10KOHM+-1% 1/8W
R 609	0171276	METAL FILM 10KOHM+-1% 1/8W
R 860	0170481	FUSE RESISTOR 22OHM+-5% 1/4W
RT 201	5007712	SEMI VARIABLE 1KOHM
RT 203	5007714	SEMI VARIABLE 4.7KOHM
RT 401	5030011	SEMI VARIABLE 100KOHM
RT 402	5030009	SEMI VARIABLE 47KOHM
RT 604	5030013	SEMI VARIABLE 470KOHM
RT 605	5030013	SEMI VARIABLE 470KOHM
RT 606	5030008	SEMI VARIABLE 22KOHM
RT 621	5030013	SEMI VARIABLE 470KOHM
RT 623	5030012	SEMI VARIABLE 220KOHM
RT 801	5007461	SEMI VARIABLE 4.7KOHM
RT1301	5007711	SEMI VARIABLE 47OHM
RT1501	5009141	VARIABLE 50KOHM
RL 401	5641571	RELAY

SEMI-CONDUCTORS

SYMBOL-NO	P-NO	DESCRIPTION
D 141	5380933	LED GL-451
D 201	5328301	DIODE MA151WK(MT)
D 203	5339131	DIODE 1SS254
D 207	5328321	DIODE MA151K (MH)
D 401	5339131	DIODE 1SS254
D 403	5339131	DIODE 1SS254
D 404	5339131	DIODE 1SS254
D 405	5339131	DIODE 1SS254
D 406	5339131	DIODE 1SS254
D 601	5339131	DIODE 1SS254
D 602	5339131	DIODE 1SS254
D 603	5339131	DIODE 1SS254
D 604	5339131	DIODE 1SS254
D 605	5339131	DIODE 1SS254
D 606	5339131	DIODE 1SS254
D 613	5339131	DIODE 1SS254
D 614	5339131	DIODE 1SS254
D 615	5339131	DIODE 1SS254
D 618	5339131	DIODE 1SS254
D 703	5339131	DIODE 1SS254
D 704	5339131	DIODE 1SS254
D 705	5339131	DIODE 1SS254
D 706	5339131	DIODE 1SS254
D 707	5339131	DIODE 1SS254
D 708	5339131	DIODE 1SS254
D 709	5339131	DIODE 1SS254
D 710	5339131	DIODE 1SS254
D 711	5339131	DIODE 1SS254
D 712	5339131	DIODE 1SS254
D 714	5339131	DIODE 1SS254
D 715	5339131	DIODE 1SS254
D 720	5339131	DIODE 1SS254
D 725	5339131	DIODE 1SS254
D 726	5339131	DIODE 1SS254
D 728	5339131	DIODE 1SS254
D 729	5339131	DIODE 1SS254
D 751	5381214	LED SEL2413E

SYMBOL-NO	P-NO	DESCRIPTION
D 801	5339131	DIODE 1SS254
D 802	5339131	DIODE 1SS254
D 803	5339131	DIODE 1SS254
D 805	5339231	DIODE 1SR35-100A
⚠ D 851	5333282	DIODE RBA-402
D 854	5339131	DIODE 1SS254
D 855	5339131	DIODE 1SS254
D 856	5339231	DIODE 1SR35-100A
D 857	5339231	DIODE 1SR35-100A
⚠ D 861	5339231	DIODE 1SR35-100A
⚠ D 862	5339231	DIODE 1SR35-100A
⚠ D 863	5339231	DIODE 1SR35-100A
⚠ D 864	5339231	DIODE 1SR35-100A
D 901	5339131	DIODE 1SS254
D 902	5339131	DIODE 1SS254
D 903	5339131	DIODE 1SS254
D 904	5339131	DIODE 1SS254
D 905	5339131	DIODE 1SS254
D 907	5339171	DIODE 1SS130
D 908	5339171	DIODE 1SS130
D 911	5339131	DIODE 1SS254
D 913	5339131	DIODE 1SS254
D 914	5339131	DIODE 1SS254
D1501	5339131	DIODE 1SS254
D1503	5339131	DIODE 1SS254
D1505	5339131	DIODE 1SS254
D1506	5339131	DIODE 1SS254
D1508	5339131	DIODE 1SS254
D1509	5339131	DIODE 1SS254
D1510	5339131	DIODE 1SS254
D1512	5339131	DIODE 1SS254
D1513	5339131	DIODE 1SS254
D1514	5339131	DIODE 1SS254
D1516	5339231	DIODE 1SR35-100A
D1517	5339231	DIODE 1SR35-100A
D1519	5332541	DIODE ERA81-004P
D1520	5332541	DIODE ERA81-004P
D1601	5339131	DIODE 1SS254
D1602	5339131	DIODE 1SS254
D1603	5339131	DIODE 1SS254
D1604	5339131	DIODE 1SS254
D1605	5339131	DIODE 1SS254
D1606	5339131	DIODE 1SS254
D2501	5339131	DIODE 1SS254
D2502	5339131	DIODE 1SS254
D2510	5339131	DIODE 1SS254
D2511	5339131	DIODE 1SS254
D2512	5339131	DIODE 1SS254
D2520	5339131	DIODE 1SS254
D2521	5339131	DIODE 1SS254
D2522	5339131	DIODE 1SS254
D2524	5339131	DIODE 1SS254
D2525	5339131	DIODE 1SS254
D2526	5339131	DIODE 1SS254
D2532	5339131	DIODE 1SS254
D2533	5339131	DIODE 1SS254
IC 141	5391282	IC DN6851
IC 142	5391282	IC DN6851
IC 201	1370445	IC HT4937D
IC 204	1388114	PWB ASSY (CHOROMA PROCESS)
IC 205	1380212	PWB ASSY (SECAM DET)
IC 206	1370731	MODULE HN7147
IC 401	1341471	IC LA7295
IC 601	1342162	IC BU2749S
IC 602	1341421	IC LA7116

SYMBOL-NO	P-NO	DESCRIPTION
IC 603	5350607	IC RC4558
IC 701	5302769	IC M50957-680SP
IC 702	5301561	IC M6M80021P
IC 703	5361942	IC S-8053ALB
IC 801	5367201	IC UPC1484CA
IC 802	5364301	IC NJM78M05A
IC 803	5721941	IC PROTECTOR
IC 851	5300452	IC STK5372H
IC 901	1345153	IC HD4074019
IC 902	5300794	IC BA6209U4
IC 903	1387951	PWB ASSY (TAPE ENDDET)
IC 904	1340111	IC PST524
IC 905	5721941	IC PROTECTOR
IC1502	1342031	IC NJM2248S
IC1503	5369431	IC LA7016
IC1510	1380472	IC PLT-623-0009
IC1511	1387912	PWB ASSY HES8052A(VPS MODEL ONLY)
IC1601	5300821	IC M54874P
IC1651	1341941	IC LB1684H
IC2503	5366981	IC M5201L
Q 141	5324661	TRANSISTOR PT-483F1
Q 142	5324661	TRANSISTOR PT-483F1
Q 201	5328971	TRANSISTOR 2SC2412KBRST
Q 202	5328331	TRANSISTOR 2SB709A(AR)
Q 204	5328971	TRANSISTOR 2SC2412KBRST
Q 205	5328971	TRANSISTOR 2SC2412KBRST
Q 206	5328971	TRANSISTOR 2SC2412KBRST
Q 209	5328971	TRANSISTOR 2SC2412KBRST
Q 210	5328331	TRANSISTOR 2SB709AR
Q 401	5327101	TRANSISTOR 2SC3553BC
Q 402	5327063	TRANSISTOR 2SC1740S
Q 601	5327031	TRANSISTOR 2SA673C
Q 606	5327063	TRANSISTOR 2SC1740S
Q 610	5327063	TRANSISTOR 2SC1740S
Q 614	5327063	TRANSISTOR 2SC1740S
Q 621	5324861	TRANSISTOR 2SD2061
Q 622	5327063	TRANSISTOR 2SC1740S
Q 623	5324861	TRANSISTOR 2SD2061
Q 624	5327063	TRANSISTOR 2SC1740S
Q 901	5327091	TRANSISTOR 2SD1504E
Q 902	5327031	TRANSISTOR 2SA673C
QR 201	5328793	TRANSISTOR DTC144K-26
QR 202	5328793	TRANSISTOR DTC144K-26
QR 205	5327082	TRANSISTOR RT1N441S
QR 207	5328793	TRANSISTOR DTC144K-26
QR 210	5328793	TRANSISTOR DTC144K-26
QR 211	5327074	TRANSISTOR DTA144ES
QR 212	5327073	TRANSISTOR DTC144ES
QR 412	5327073	TRANSISTOR DTC144ES
QR 602	5327073	TRANSISTOR DTC144ES
QR 603	5327073	TRANSISTOR DTC144ES
QR 604	5327073	TRANSISTOR DTC144ES
QR 607	5327073	TRANSISTOR DTC144ES
QR 609	5327073	TRANSISTOR DTC144ES
QR 611	5327073	TRANSISTOR DTC144ES
QR 615	5327073	TRANSISTOR DTC144ES
QR 616	5327073	TRANSISTOR DTC144ES
QR 801	5327073	TRANSISTOR DTC144ES
QR 901	5327073	TRANSISTOR DTC144ES
QR 902	5327073	TRANSISTOR DTC144ES
QR 903	5327073	TRANSISTOR DTC144ES
QR1301	5328791	TRANSISTOR DTC124K(25)
QR1501	5327074	TRANSISTOR DTA144ES-T
QR1502	5327073	TRANSISTOR DTC144ES
QR2501	5327082	TRANSISTOR RT1N441S

SYMBOL-NO	P-NO	DESCRIPTION
QR2502	5327073	TRANSISTOR DTC144ES
QR2503	5327073	TRANSISTOR DTC144ES
QR2504	5327073	TRANSISTOR DTC144ES
QR2510	5327073	TRANSISTOR DTC144ES
Q1510	5327062	TRANSISTOR 2SC1740SR(S.R)
Q1512	5327012	TRANSISTOR 2SA844CD-TB
Q1530	1320012	TRANSISTOR 2SA933 (S.R)
Q1532	5327062	TRANSISTOR 2SC1740SR(S.R)
Q1580	5327062	TRANSISTOR 2SC1740SR(S.R)
Q1581	5327062	TRANSISTOR 2SC1740SR(S.R)
Q1595	5327062	TRANSISTOR 2SC1740SR(S.R)
Q1596	5323904	TRANSISTOR 2SC1740S
Q2501	5327021	TRANSISTOR 2SA844CD-TB
Q2502	5327151	TRANSISTOR 2SA952-ML2
Q2510	5327001	TRANSISTOR 2SC458CD
Q2511	5327001	TRANSISTOR 2SC458CD
Q2512	5327021	TRANSISTOR 2SA844CD-TB
Q3501	1320012	TRANSISTOR 2SA933(S.R)
ZD 601	5339255	ZENER DIODE HZS12-C3T
ZD 602	5339274	ZENER DIODE HZS15-3
ZD 701	5339265	ZENER DIODE HZS9-B3
ZD 702	5339151	ZENER DIODE RD2.7E-B2
ZD 802	5339256	ZENER DIODE HZS30
ZD 803	5339252	ZENER DIODE HZS5-C2
ZD 804	5339252	ZENER DIODE HZS5-C2
ZD 901	5339271	ZENER DIODE HZS9A2
ZD 902	5339262	ZENER DIODE HZS6-C2
ZD 903	5339262	ZENER DIODE HZS6-C2
ZD 904	5339256	ZENER DIODE HZS30

TRANSFORMERS

SYMBOL-NO	P-NO	DESCRIPTION
T 401	5262532	BIAS COIL
⚠ T 850	5214181	TRANSFORMER,POWER

COILS

SYMBOL-NO	P-NO	DESCRIPTION	
L 201	5153037	CHOKE COIL	33UH+-5%
L 202	5121178	CHOKE COIL	39UH+-10%
L 203	5159077	CHOKE COIL	100UH+-10%
L 204	5159149	CHOKE COIL	47UH
L 205	5159077	CHOKE COIL	100UH+-10%
L 207	5159068	CHOKE COIL	22UH+-10%
L 209	5159066	CHOKE COIL	15UH+-10%
L 211	5159074	CHOKE COIL	56UH+-10%
L 212	5159077	CHOKE COIL	100UH+-10%
L 213	5159076	CHOKE COIL	82UH
L 216	5159141	CHOKE COIL	10UH
L 217	5153041	CHOKE COIL	56UH+-10%
L 219	5159079	CHOKE COIL	150UH+-10%
L 220	5159079	CHOKE COIL	150UH+-10%
L 221	5159077	CHOKE COIL	100UH+-10%
L 222	5159077	CHOKE COIL	100UH+-10%
L 223	5159077	CHOKE COIL	100UH+-10%
L 224	5159076	CHOKE COIL	82UH
L 225	5159089	CHOKE COIL	820UH
L 401	5159113	CHOKE COIL	8.2MH
L 402	5159081	CHOKE COIL	180UH+-10%
L 403	5159111	CHOKE COIL	5600UH
L 404	5159081	CHOKE COIL	180UH+-10%
L 405	5159115	COIL	2200UH
L 406	5159089	CHOKE COIL	820UH+-10%
L 901	5159077	CHOKE COIL	100UH+-10%
L 903	5159077	CHOKE COIL	100UH+-10%
L1501	5159077	CHOKE COIL	100UH+-10%
L1502	5159077	CHOKE COIL	100UH+-10%
L1520	5159068	CHOKE COIL	22UH+-10%
L1530	5159077	CHOKE COIL	100UH+-10%

SYMBOL-NO	P-NO	DESCRIPTION	
L1591	5159077	CHOKE COIL	100UH+-10%
L2501	5159077	CHOKE COIL	100UH+-10%
L2502	5159154	CHOKE COIL	100UH
L2510	5159071	CHOKE COIL	33UH+-10%
L2511	5159077	CHOKE COIL	100UH+-10%
L2512	5159077	CHOKE COIL	100UH+-10%
L2520	5159077	CHOKE COIL	100UH+-10%
⚠ LF 851	5272292	FILTER	
⚠ LF 852	5272292	FILTER	
		CRYSTALS	
X 701	5784473	CRYSTAL	
X 702	5783001	CRYSTAL	
		MISCELLANEOUS	
BL2501	5272372	CORE	
BL2502	5272372	CORE	
BL2503	5272372	CORE	
BL2504	5272372	CORE	
BZ 701	5400071	BUZZER	
CE 901	5784471	OSCILLATOR	
CP 201	5163685	LC FILTER	
CP 203	5163553	LC FILTER	
CP 204	5163684	LC FILTER	
CP 205	5163805	LC FILTER	
CP 207	5785388	DELAY LINE	
CP 208	5163891	LC FILTER	
CP 209	5163832	LC FILTER	
CP1501	5163204	COIL	
DG 701	5315151	ELUORESCENT INDICATOR TUBE	
F 850	5720174	FUSE 630MA	
⚠ F 851	5721061	FUSE 1.6A	
⚠ F 852	5720175	FUSE 0.8A	
IR 701	5317191	MODULE,INF	
J2502	5672973	PLATE,JACK	
S 141	5635321	SWITCH	
S 142	5635331	SWITCH	
S 703	5635061	SWITCH	
S 704	5635061	SWITCH	
S 705	5635061	SWITCH	
S 709	5635061	SWITCH	
S 710	5635061	SWITCH	
S 711	5635061	SWITCH	
S 712	5635061	SWITCH	
S 713	5635061	SWITCH	
S 714	5635061	SWITCH	
S 715	5635061	SWITCH	
S 716	5635061	SWITCH	
S 717	5635061	SWITCH	
S 718	5635061	SWITCH	
S 719	5635061	SWITCH	
S1501	5622462	SLIDE SWITCH	
S1504	5622462	SLIDE SWITCH	

MECHANICAL PARTS LIST (LISTE DER MECHANISCHEN TEILE) –

SYMBOL-NO	P-NO	DESCRIPTION
		FOR FINAL ASSEMBLY
101	6231138	DOOR,CASSETTE
102	7741444	FELT (LEG)
103	6003315	COVER,BOTTOM
104	6004194	CASE.TOP
105	6484323	PANEL.FRONT (M640E ONLY)
105	6484327	PANEL.FRONT (M645E ONLY)
105	6484326	PANEL.FRONT (M646E ONLY)
106	6072211	BUTTON,PE
107	6483051	PANEL,REAR
108	7792395	HOLDER.TRANS
109	6808961	HOLDER,PWB
110	6800971	STUD
111	7495671	PLATE
112	6407471	COVER,FUSE
113	5885991	PLUG CABLE
114	6794591	BUSHING
⚠ 115	5850791	CORD,POWER
116	7700872	SHEET,PROTECT
117	6714216	NYLON RIVET
⚠ 118	5214181	TRANSFORMER,POWER
119	6229391	PIECE,REAR
121	5588491	TUNER IF BLOCK
122	5589251	CONVERTER、RF (M640E ONLY)
122	5589252	CONVERTER.RF (M645E/M646E ONLY)
123	6808821	HOLDER.DIG
124	6071411	BOTTON (M640E ONLY)
124	6071421	BOTTON (M645E/M646E ONLY)
127	6484377	DOOR、CONTROL (M640E ONLY)
127	6484378	DOOR.CONTROL (M645E ONLY)
127	6484381	DOOR.CONTROL (M646E ONLY)
130	6809911	HOLDER.PWB
202	6911101	SCREW
203	7412852	BASE-ACE HEAD
204	5446631	HEAD-AUDIO CONTROL
205	6304906	SPRING
206	6522752	SPRING
207	7785673	NUT
208	6896914	HOLDER
209	6555501	SPRING
210	6415533	REEL,SUPPLY
211	7789123	POLYSLIDER WASHER
212	6415543	REEL,TAKE UP
213	7789122	POLYSLIDER WASHER
214	6975766	ARM,PRESSER ROLLER
215	6804273	BLOCK,SLIDER
216	7412822	PLATE
217	7412816	GEAR,LOADING (L)
218	7412806	GEAR,LOADING (R)
219	6911551	GUIDE ROLLER BASE(IN)
220	6344741	GUIDE ROLLER
221	69115723	BRACKET
222	6911003	BASE,CYLINDER
223	5445851	HEAD FULL ERASE
224	6897473	ARM,IMPEDANCE
225	4508237	GUIDE,TAPE
226	6555431	SPRING
227	7413665	HOLDER-BAND
228	7412863	ARM
229	6555444	SPRING
230	6897264	HOLDER
231	6896751	ARM
232	6555061	SPRING
233	6976371	ARM

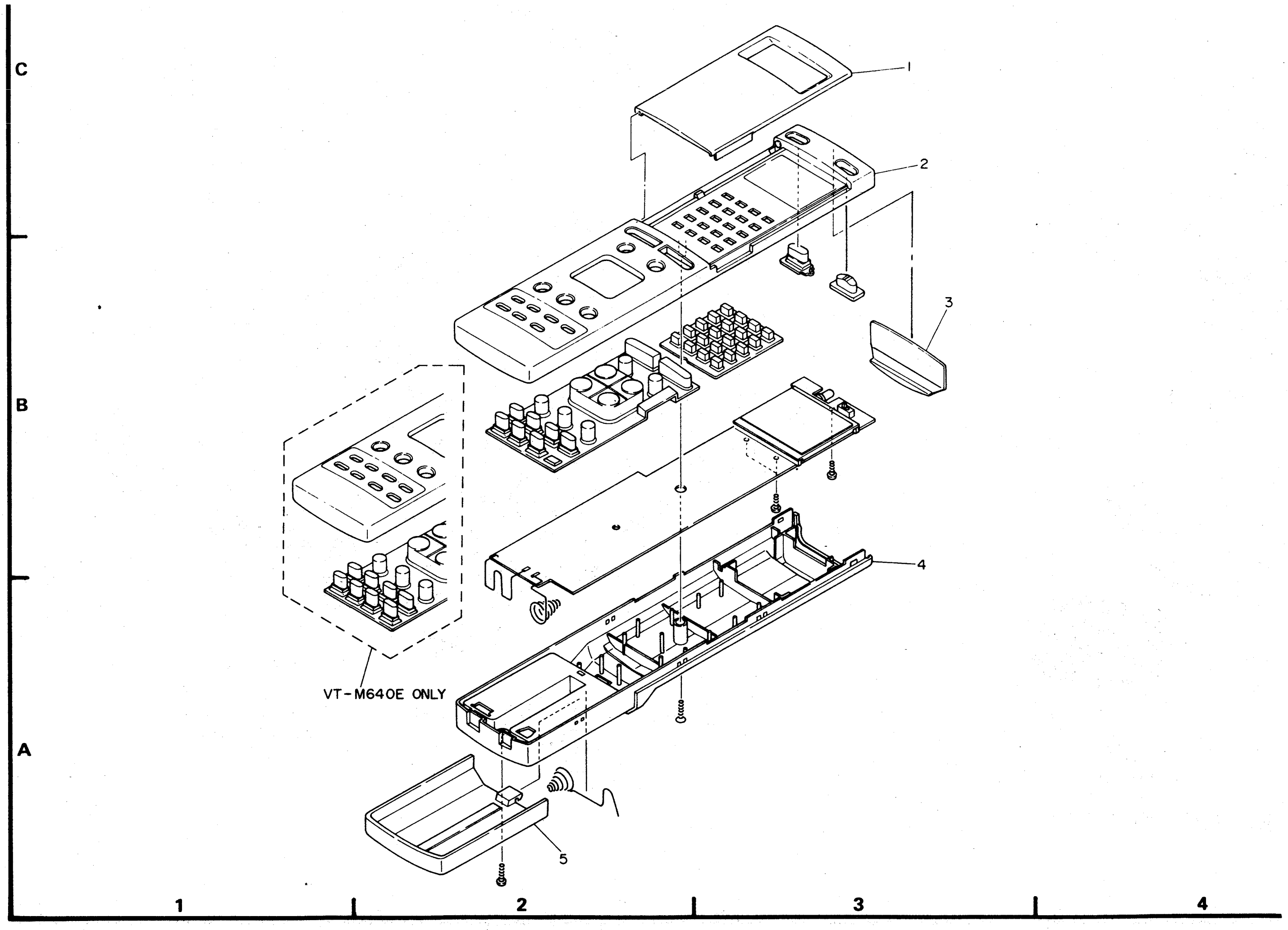
SYMBOL-NO	P-NO	DESCRIPTION	
234	6898472	ARM,IDLE	
235	7429674	LOAD BLOCK	
236	7398631	BRACKET	
237	7412881	ARM	
238	6976551	ARM	
239	7412892	ARM	
240	7428072	ARM,OPERATION	
241	6897241	ARM	
242	6551151	SPRING	
243	6804792	BRAKE	
244	6896894	HOLDER,MOTOR	
245	6896852	ARM	
246	6897251	ARM	
247	6555483	SPRING	
248	6897271	ARM	
249	6897065	GEAR,MODE	
250	6434861	WORM WHEEL	
251	6555052	SPRING	
252	7799012	WASHER	
253	7786623	POLYSLIDER WASHER	
254	4508235	GUIDE	
261	7079171	PWB ASSY PRE/REC AMP	
271	7415782	BRACKET	
272	7415793	BRACKET	
301	5571471	MOTOR,CAPSTAN	
302	6896951	CULUTCH BASE ASSY	
303	6351555	BELT	
304	6897095	ARM,FF/REW	
305	6434851	RACK	
402	7412574	BRACKET,SIDE(R)	
403	6896685	BRACKET,SIDE(R)	
404	6896971	WORM WHEEL ASSY	
405	6435571	WORM	
406	4508221	WORM SHAFT	
407	6896632	ARM-SWITCH	
408	6897041	ARM-SWITCH	
409	6302474	SPRING	
410	6896623	ARM,DOOR	
411	7412583	BRACKET-GEAR	
412	7449173	HOLDER	
413	7449163	BASE,HOLDER	
414	6896664	HOLDER,CASSETTE (R)	
415	7428113	HOLDER,STAY	
416	6806641	ARM	
417	6897001	ARM	
418	6555043	SPRING	
419	6896673	HOLDER,CASSETTE (L)	
420	7412944	ARM	
421	6555771	SPRING	
422	7412952	SPRING	
423	6806521	HOLDER,FRONT	
424	7580791	SHAFT ASSY	
425	7412552	BRACKET,SIDE(L)	
426	6323724	SPRING	
427	7794391	WASHER	
501	5436103	UPPER CYLINDER	(CY-Z4P)
502	5436223	CYLINDER,LOWER	(CY-Z4P)
503	5792635	BRUSH,CYLINDER	
901	8699412	SCREW (3X12)	BLACK
902	7784428	SCREW (M3)	
903	8699410	SCREW(3X10)	
904	8691412	SCREW (3X12)	
905	8691412	SCREW (3X12)	
906	7785351	SCREW (4X14)	
951	8691410	SCREW	

SYMBOL-NO	P-NO	DESCRIPTION
952	86913103	SCREW
953	8699408	SCREW
954	7781872	SCREW-3MMDX8MM
955	7773086	SCREW
956	8741414	SCREW (3X14)
957	8691412	SCREW (3X12)
958	8691408	SCREW (3X8)
959	8741408	SCREW (B3X8)
960	8741412	SCREW (B3X12)
961	7785941	SCREW
963	87114043	SCREW - 3X4 PAN HEAD SCREW
		FOR ACCESSARIES
	5858311	CONNECTION CODE
	5614253	REMOTE HAND SET

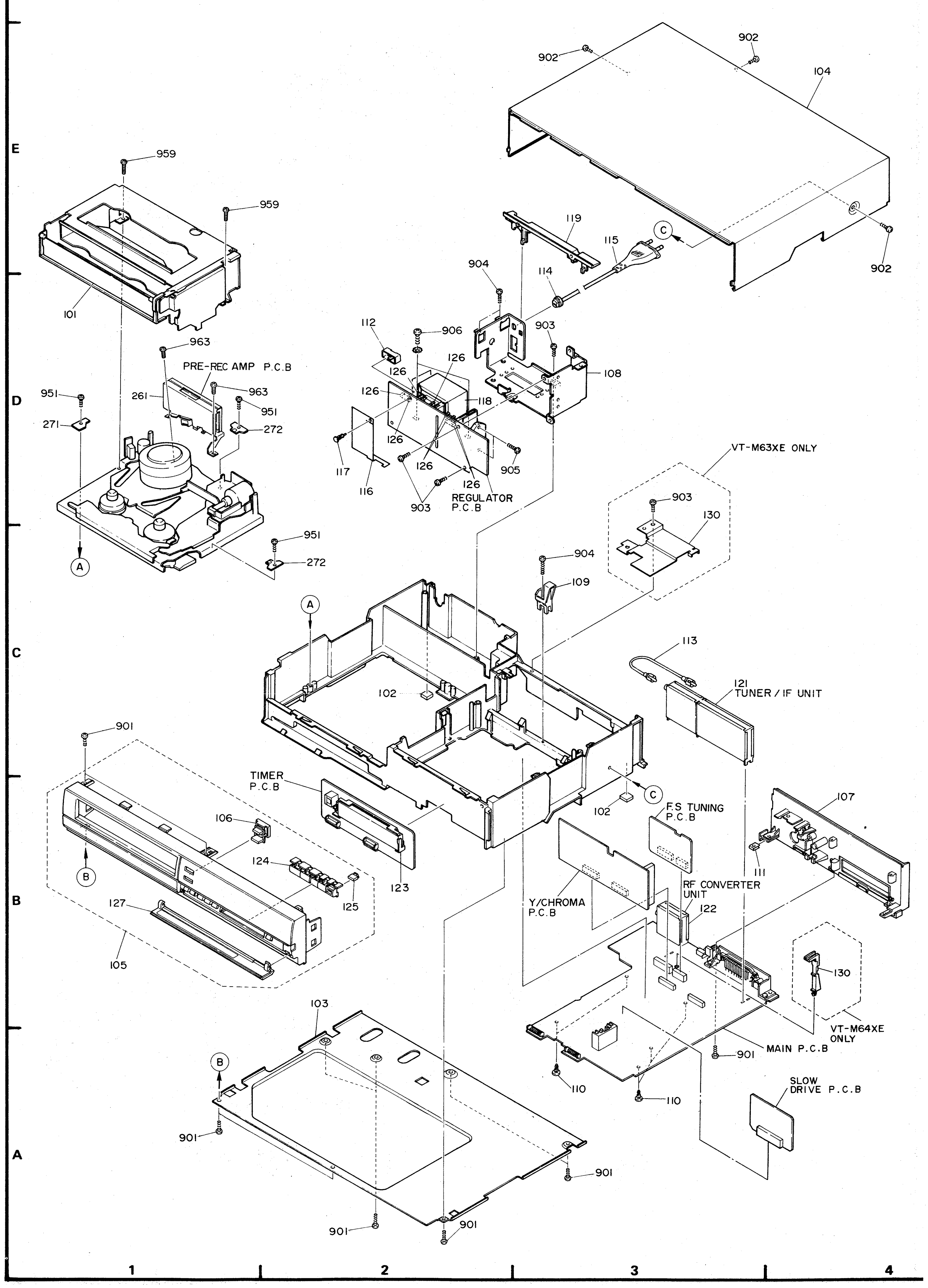
SYMBOL-NO	P-NO	DESCRIPTION
		FOR REMOTE CONTROLLER UNIT
1	5614061	COVER
2	5614283	CASE.UPPER (M630E ONLY)
2		CASE.UPPER (M640E ONLY)
3	5614062	PLATE.CLEAR
4	5614063	CASE.BOTTOM
5	5614066	CASE.BATTERY

EXPLODED VIEWS (EXPLOSIONZEICHNUNGEN)

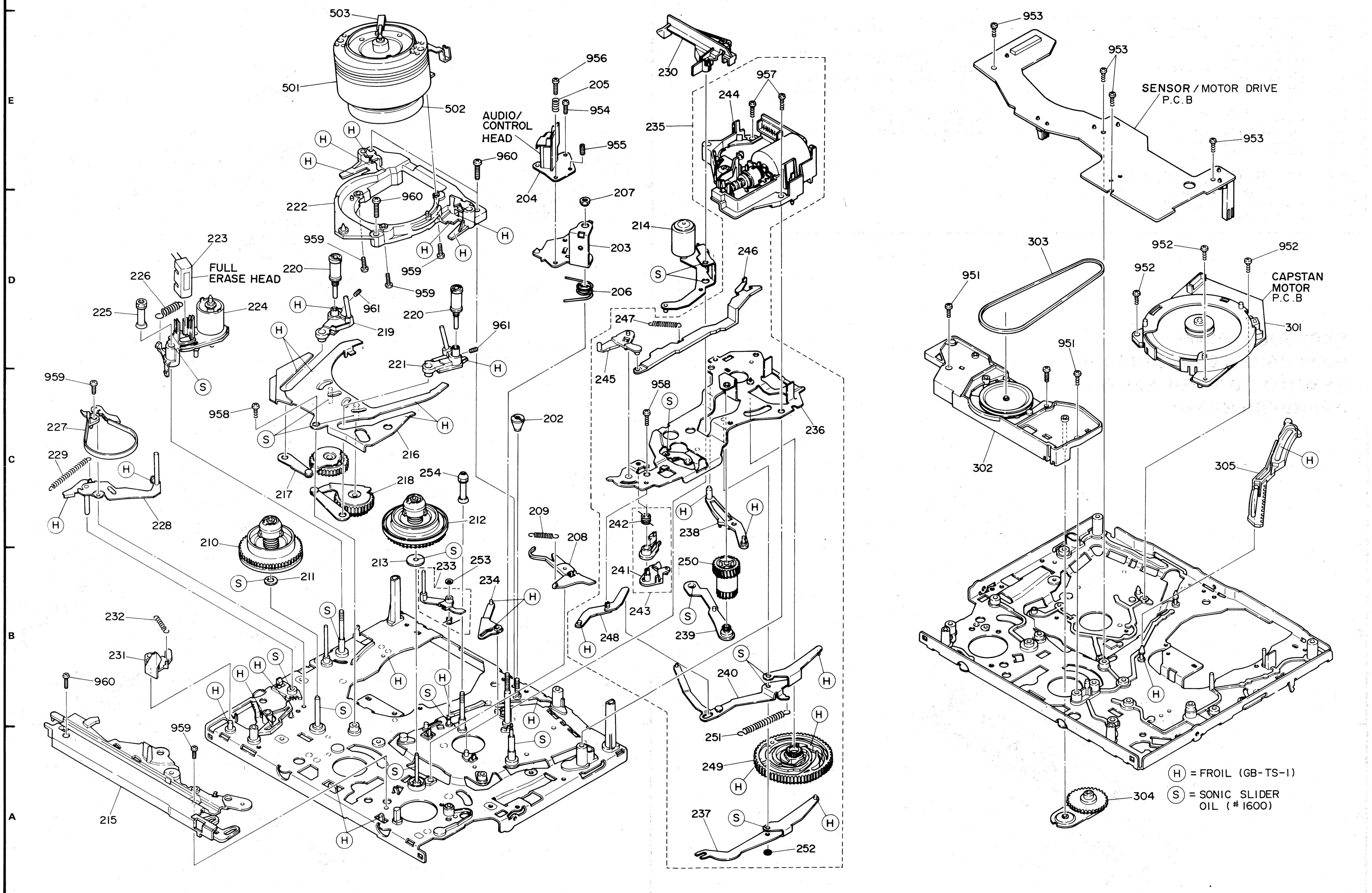
REMOTO CONTROL SECTION (FERNBEDIENUNG)


C
B
A
1
2
3
4
5
VT-M640E ONLY
1
2
3
4

CABINET SECTION (GEHAUSEEINHEIT)


E
D
C
B
A
902
902
104
902
959
959
119
115
C
101
904
114
903
108
112
906
126
963
PRE-REC AMP P.C.B
963
261
951
951
271
272
126
118
126
126
117
116
903
126
126
REGULATOR P.C.B
905
VT-M63XE ONLY
903
130
951
272
A
904
109
A
113
102
121 TUNER / IF UNIT
901
TIMER P.C.B
106
C
102
F.S TUNING P.C.B
107
B
124
125
123
111
127
Y/CHROMA P.C.B
RF CONVERTER UNIT
122
105
130
VT-M64XE ONLY
103
901
MAIN P.C.B
B
110
110
SLOW DRIVE P.C.B
901
901
901
901
1
2
3
4

CHASSIS SECTION (CHASSIS)


E
D
C
B
A
503
501
502
AUDIO/
CONTROL
HEAD
956
205
954
955
960
204
207
203
206
230
235
957
244
214
246
247
245
958
236
953
953
SENSOR / MOTOR DRIVE
P.C.B
953
303
952
952
952
CAPSTAN
MOTOR
P.C.B
301
951
951
302
305
222
960
959
959
959
223
FULL
ERASE HEAD
226
225
224
220
961
219
220
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221
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227
958
216
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960
959
215
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304
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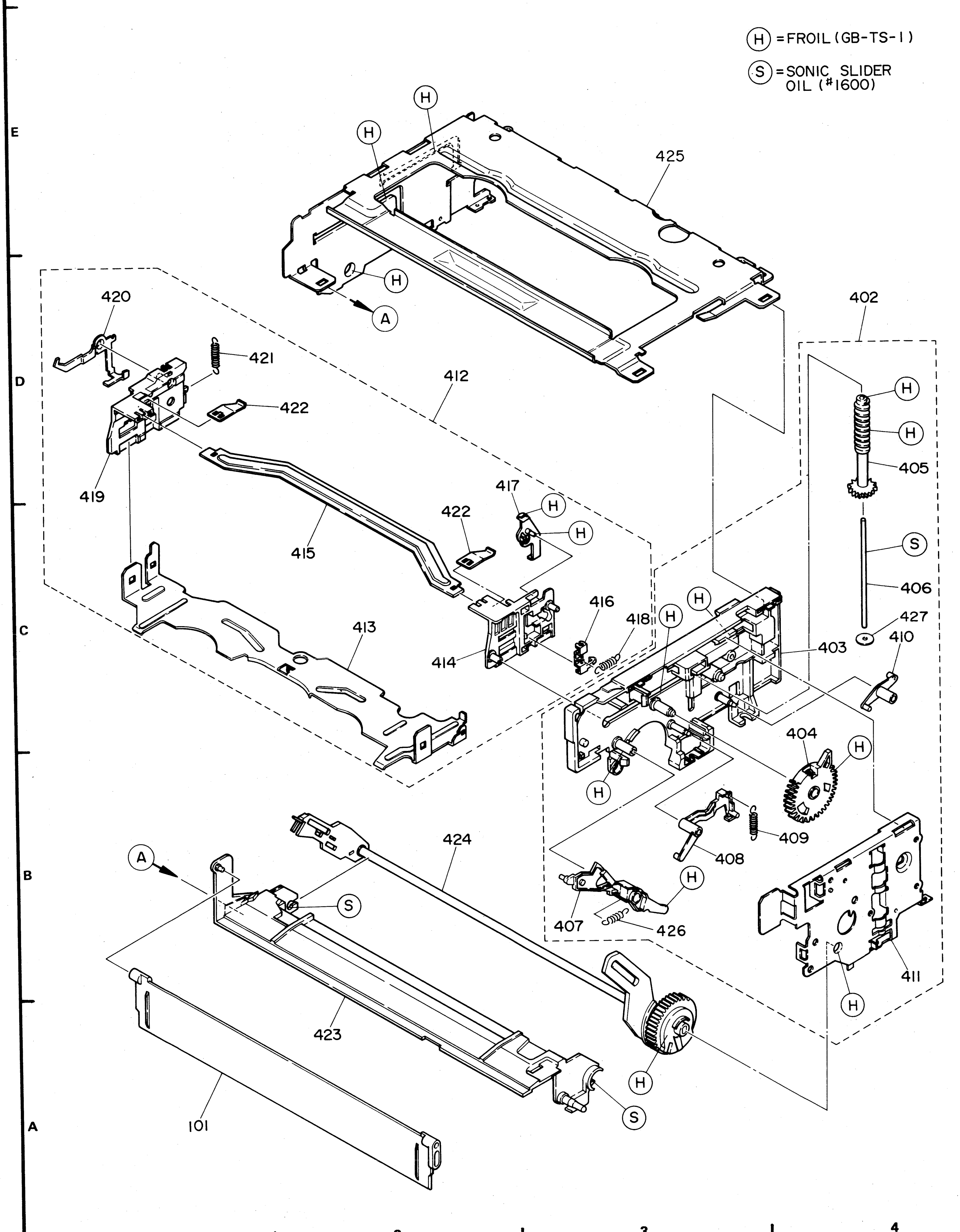
7
8

Ⓗ = FROIL (GB-TS-1)

Ⓢ = SONIC SLIDER OIL (# 1600)

CASSETTE LOADING MECHANISM SECTION (CASSETTEN-LADEMECHANISMUS)


Ⓗ = FROIL (GB-TS-1)

Ⓢ = SONIC SLIDER OIL (#1600)

E
D
C
B
A
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4
H
425
H
A
402
420
421
412
422
H
H
405
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417
422
415
S
406
416
418
H
413
427
403
410
414
404
H
H
409
408
424
A
S
407
426
H
411
H
423
H
S
101

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VT-M630E/M640E (CT)
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VT-M636E/M646E (VPS)

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